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Vol. XI. NOV. AND JAN., 1928-'29. No. 6-7.

CONTRIBUTIONS TO THE BOTANY OF MICHIGAN, NO. 16.—MISCELLANY.

OLIVER ATKINS FARWELL

Lilium Michiganense Farw. Wild Red Lily. In sparse woods and open fields on Belle Isle, where it was once abundant. No. 1268a, July 21, 1892. The var. *uniflorum* Farw. is probably the most abundant form of the species, but it is given a close run by the following variety. Detroit: Belle Isle, No. 1674c, July 13, 1900; Linden Park, No. 1608a, July 9, 1898 and No. 1777a, July 12, 1902. Variety *umbelliferum* Farw. Detroit, No. 1607a, July 9, 1898.

Dioscorea villosa Linn. Wild Yam. A climbing vine similar to *Smilax*, but more slender and unarmed. Yellowish flowers in axillary panicles. Climbing over shrubs and herbs in moist thickets. The Yam family is one of the few monocotyledonous groups that have netted-veined leaves. A tropical species produces a tuber that is highly prized as an article of food. The fruit is a membranaceous, three-winged capsule. The rhizome is largely used in medicine. In the typical species the rhizome is very slender and the leaves are pubescent to glabrate underneath. Ypsilanti, No. 1156, June 23, 1891. Detroit: Belle Isle, No. 1156a, August 13, 1892 and No. 1673a, June 29, 1900; Mack Avenue woods, No. 2026½, June 30, 1907. Parkedale, No. 2867½, July 14 and No. 3040, August 4, 1912. A variety with glabrate to glabrous leaves is var. *glabrifolia* (Bartlett) n. comb. (*D. paniculata* Mx., var. *glabrifolia* Bartlett). Detroit (Mack Avenue woods), No. 2025, June 23, 1907. Another variety, var. *glabra* Lloyd, has a much larger and more contorted rhizome, petioles pubescent at the apex, leaves usual-

ly glabrous beneath, but often more or less pubescent, and glaucous when mature. It is the rhizome of this variety that constitutes the greater part of the medicinal drug of today. Algonac, No. 2721a, June 16, 1912.

Prof. H. H. Bartlett in 1910 published a revision of the U. S. species of *Dioscorea* as Bulletin 189 of the Bureau of Plant Industry, U. S. Dept. of Agriculture. He recognized five species, two of them new, and adopted *D. paniculata* Mx. for *D. villosa* Linn. On the map illustrating the distribution of this species, it is not represented in the region south of the Ohio and Potomac rivers, yet the specimen of Clayton, which came from Virginia, is acknowledged by Mr. Bartlett to be *D. paniculata* Mx. Small, in the appendix of the second edition of his Flora of the Southern U. S., adopts the revision of Prof. Bartlett, giving essentially the same ranges. In *D. glauca* Muhl. (var. *glabra*, above) Bartlett says of the leaves, usually glabrous beneath, while Small says, usually finely pubescent; both say, glaucous. Bartlett cites a specimen of A. H. Curtiss, Bedford Co., Va., No. 43953, under *D. glauca*. In the herbarium of Parke, Davis & Company in a specimen of *D. glauca* collected in Bedford Co., Va., by A. H. Curtiss in May, year not given. It is a flowering specimen and the leaves are paler beneath but show no sign of glaucosity; they are rather densely but minutely pubescent. The range is given as Penna. to Mo. and S. C.; that of the variety *glabrifolia*, Conn. to Md. and, skipping the intermediate regions, Mo. and eastern Tenn. to Tex. It will be seen that Michigan is beyond the ranges given for the above named varieties; nevertheless we have them.

Salsola Kali Linn. Russian Thistle. The glabrous state of the type was gathered at Linden Park in Detroit. The fruit is lead-colored. No. 1407a, August 8, 1893.

Salsola Kali Linn, var. *Caroliniana* (Walt.) Nutt. Like the above but fruit larger and roseate; in drying the color is apt to disappear. Marquette, No. 1475a, August, 1900. Detroit: Linden Park, No. 1764½, Sept. 26, 1901 and No. 1872½, Sept. 9, 1904. Northville, No. 6447, Oct. 18, 1922, wrongfully referred in an earlier report to the next variety.

Salsola Kali Linn, var. *tenuifolia* Tausch. Pubescent,

leaves filiform and elongated, fruit lead-colored. Detroit, No. 1475, July 23, 1894 and No. 3216, Oct. 20, 1912. Rochester, No. 2960, July 28, 1912 and No. 3219, Oct. 27, 1912.

Sagina nodosa (Linn) Fenzl. Pearlwort. A slender plant of the Pink family, usually found on wet, rocky shores. A few miles northwest of Clifton on the shores of Lake Superior, No. 363, June 1, 1886. The typical plant has glabrous calyx, pedicels, etc.; but a variation has those parts glandular and is var. *glandulosa* (Bess.) Presl. On wet, rocky shores of Lake Superior at Copper Harbor, No. 7752½, August 5, 1926.

Rubus parviflorus Nutt. In Michigan this species is commonly called Thimbleberry. Salmon Berry is an unheard of name. The flowers are of medium size, white, the petals averaging about one-half of an inch. The fruit is much sought by everyone wherever the plant occurs, for it makes delicious pies, jam, etc. Rocky woods, etc. Cliff Mine, No. 262, July 15, 1885. Copper Harbor, No. 1611b, August 20, 1898. Marquette, No. 262a, July 6, 1895. Lake Linden, No. 6591, June 25, 1923. [The western plant has flowers about twice as large, petals averaging about one inch, and the plants are less harsh. The leaves and stems are of a pale green, those of the eastern plants being of a yellowish green. It may be known as var. *grandiflora* n. var. (*R. Nutkanus Moc.*) A variation of this, on the Pacific coast mainly, has the leaves densely tomentose beneath and this may be known as subvar. *velutinus* (*Rubus velutinus* H. & A.) n. subvar.]

Rubus Canadensis Linn. Blackberry. This is the common Blackberry of the Keweenaw Peninsula and often is 7 or 8 feet or more high. The typical variety is sparsely prickly on the angles of the purplish stems. No. 184, August 22, 1884. Variety *Millspaughii* (Britt.) n. comb. is entirely unarmed and is the tallest variety. No. 183b, June 28, 1895. Variety *elegantulus* (Blanchard) n. comb. is copiously prickly on the angles and is the lowest variety. No. 3064, August 12, 1912.

Fragaria Virginiana Duchesne. Strawberry. The most abundant and widely dispersed of our native Strawberries. Cliff Mine, No. 65, August 31, 1883. Belle Isle, Nos. 65a, May 14 and 65b, May 27, 1893. Parkedale, No. 2546, May 19, 1912.

Algonac, No. 2719, June 16, 1912. Quite variable in shape of leaflets and character of pubescence. In the typical species the hairs on the petioles and scapes range from divaricate to loosely appressed, generally about horizontal; that on the pedicels is appressed. Fruit subglobose. Variety *Canadensis* (Mx.) n. comb. has the pubescence on the scapes sparse and subappressed, while that of the pedicels is more or less spreading; fruit smaller and more conical. Cliff Mine, No. 64, August 31, 1883. Detroit: Linden Park, No. 64a, May 14, 1901; Belle Isle, No. 1973a, May 24 and No. 1974b, June 16, 1906; Mack Avenue woods, No. 2020a, June 9, 1907. Algonac, No. 2720, June 16, 1912. Variety *Terrae-novae* (Rydb.) n. comb. has the pubescence on both peticles, and scapes sparse and subappressed. Cliff Mine, No. 3913, October 8, 1914. Detroit: Belle Isle, No. 65c, May 27, 1893. Variety *Illinoensis* (Price) A. Gray. A larger and coarser plant with the pubescence on the pedicels as widely spreading as on the petioles and scapes. Cliff Mine, No. 1732, August, 1901. Detroit, No. 1975½, June 18 and No. 1976b, June 20, 1906.

Fragaria vesca Linn. Differs from the preceding species chiefly in bearing the seed superficially on the smooth surface of the receptacle; in the other the seed is borne in sunken spots or pits. Cliff Mine, No. 66, August 31, 1883. Ypsilanti, No. 66a, June 13, 1891. A variation in which the receptacle is white is var. *alba* (Ehrh.) Rydb. Rochester, No. 2628, June 9 and No. 2748, July 28, 1912. Another variation with the pubescence of the scapes and often the petioles appressed as in the pedicels is var. *Americana* Porter. Cliff Mine, No. 739, July 7, 1890. Machinac Island, No. 739a, June 20, 1895. Marquette, No. 739b, July 6, 1895. Parkedale, No. 2650, June 9, 1912. Utica, No. 4181, June 6, 1916. Washington, No. 6204b, June 21, 1922. Oxford, No. 6518h, June 6, 1923.

Comarum palustre Linn. Purple or Marsh Cinquefoil or Marshlocks or Fivefinger. Frequent in swamps and peat bogs. The typical variety is non-glandular and is scarce. Cliff Mine, No. 400, June 30, 1886.

Comarum palustre Linn, var. *glandulosum* n. var. Peduncles and bractlets glandular villous, otherwise like the typical variety. Have previously reported this as var. *villosum* Pers.

Pontiac, Nos. 5264 and 5265, June 29, 1919. Eagle Harbor, No. 6633, June 29, 1923.

Potentilla intermedia Linn. Downy Fivefinger. Well established in Southeastern Michigan. In addition to places already reported I have found it at the following places: Island Lake, No. 1213b, July 16, 1905. Dead Lake, No. 2165, July 16, 1910. Portage Lake, No. 5839, June 12, 1921. Ypsilanti, No. 6220, June 28, 1922.

Crataegus exornata Sarg. Hawthorn. Thorn Apple. A low shrub of wet pastures, etc. Frequent in Keweenaw county. Cliff Mine, No. 1882a, October 4, 1904.

Crataegus borealis Ashe. A low shrub of rocky bluffs. Frequent in Keweenaw County. Probably belongs to the *Tenuifoliae*. Cliff Mine, No. 1882b, October 4, 1904; No. 117, June 30, 1884.

Gentiana alba Muhl. White Gentian. Flowers white. In low or moist grounds on Belle Isle, No. 1335, September 16, 1892. The most abundant form of this species has blue flowers and has been named *G. Andrewsii* by Grisebach. As it is only a color form it should be known as *Gentiana alba* f. *Andrewsii* (Griseb.) n. comb. Belle Isle, No. 1334, September 16, 1892. Rochester, No. 3529, October 5, 1913 and No. 4137, October 24, 1915. Parkedale, No. 3543, October 5, 1913. Ypsilanti, No. 4669, September 30, 1917. Marl Lake, No. 5706a, September 18, 1920. Orion, No. 4696, October 11, 1917. Algonac, No. 7277, October 15, 1924. Also on Squirrel Island, Ontario, No. 5679, September 16, 1920. In marly or gravelly grounds, the plants are reduced, usually to 6 or 7 inches in height, rarely one foot, with leaves an inch and a half long or less, blue flowers terminal only, usually one, occasionally two, rarely three. It may be known as *Gentiana alba* Muhl., var. *pauciflora* n. var. Algonac, No. 7277½, October 15, 1924. Sylvan Lake, No. 7281, October 22, 1924.

Gentiana clausa Raf. Allied to the above and very much like it, superficially. Reported as *G. Saponaria* Linn. Found only at Lakeville. No. 1750, September 2, 1901.

Asclepias incarnata Linn, var. *longifolia* A. Gr. A very narrow-leaved variety of the species from Texas and New Mexico. I place here a plant collected at Ypsilanti with linear-

lanceolate leaves well within the limitations given by Dr. Gray for this variety. No. 7061, August 20, 1924.

[*Lappula Redowskii* (Hornem.) Greene, var. *cupulata* (A. Gray) Jones. In the Bulletin of the Torrey Botanical Club, (1909) XXXVI, 676, Rydberb described *L. leucotricha* from Arizona and Utah. He referred to it, Rusby's No. 281 from Clifton, Ariz., April, 1881. The species is white flowered and the fruit not cupulate. In the herbarium of Parke, Davis & Co., the sheet bearing No. 281 of Rusby has two collections mounted thereon. One is from "sandy bottoms of cannons, San Francisco Mts., A. T., April, 1881." The other, evidently the same variety, comes from "Ash Fork, Ariz. T., in shade of Junipers, May 12, 1883." The flowers are blue and the fruit cupulate and of the heteromorphous condition. As the plants are erect, they fall to this variety. Arizona, as a general thing, is excluded from the range of variety *cupulata*, but Rusby's collections prove it should be included.]

Lonicera hirsuta Eaton. Honeysuckle. Leaves pubescent on both surfaces and ciliate. Outer surface of corolla glandular pubescent. Often climbing high to the tops of tall trees. *Caprifolium Douglasii* Lindl. (1830) is generally referred to this species. *Lonicera Douglasii* D. C., Prodr. (1830) IV, 332, generally referred here, at least in large part is *L. dioica* var. *Douglasii* and is the correct specific name of that variety when treated as a distinct species. Certainly De Candolle's description of glabrous petioles (*petiolatis glabris*), leaves pubescent beneath (*extus tomentosis*) exserted stigmas and included stamens, intensely green leaves (*folia intense viridia*) does not apply to *L. hirsuta*. The only part of the description that can apply to *L. hirsuta* is that referring to the ciliate leaves, and this can be construed either as an error or as a character to be excluded along with the plant from which the character was taken. Frequent in Keweenaw Co. Cliff Mine: No. 206, (high climber) May 30, 1885; No. 205a, (low, bunched mass of open fields) June 16, 1885.

Lonicera dioica Linn. Outer surface of corolla glabrous, leaves not ciliate, glabrous, glaucous beneath. Twining but never very high. Widely distributed over Michigan, but rather scarce. Copper Harbor, No. 205b, July 1, 1895. Highland

Park, No. 205d, May 7, 1896. Detroit in vicinity of Palmer Park, No. 1606b, May 26, 1898 and No. 3955, May 31, 1915. Also near the State line but on the Ohio side, near Alexis, No. 7296, April 15, 1925.

Lonicera dioica Linn, var. *Douglasii* (A. Gr.) n. comb. *L. Douglasii* D. C. largely; *L. parviflora* Lam., var. *Douglasii* A. Gr., Man. (1848) 171, 172; *L. hirsuta* Eaton, var. *glaucescens* Rydb.; *L. glaucescens* Rydb.; *L. dioica* Linn, var. *glaucescens* (Rydb.) Butters. When A. Gray published his var. *Douglasii* he gave a good description without quoting synonyms so that technically at least, it is not based upon either the *Caprifolium Douglasii* Lindl. or the *Lonicera Douglasii* D. C., but has a distinct and separate origin all its own; there is nothing in Gray's description to indicate *L. hirsuta* and his varietal name, being the oldest, must replace that of *glaucescens*. *L. Douglasii* D. C. pro parte, is the proper designation as a species. See under *L. hirsuta*. Usually low forming dense masses of twisting, curling stems. Leaves, not ciliate, green and glabrous above, glaucous and pubescent below, outer surface of corolla pubescent but not glandular. Much more abundant than the typical species. Cliff Mine: No. 205, May 30, 1885; No. 850b, July 2, 1895; No. 3066, August 22, 1912. Copper Harbor: No. 850a, July 1, 1895; No. 1612c, August 22, 1898. Eagle Harbor, No. 6615, June 29, 1923. Detroit: vicinity of Palmer Park, No. 205e, 1897; Belle Isle, No. 1907½, May 29, 1905; Mack Avenue woods, No. 2025½, June 23, 1907. Orion, Nos. 205c, May 30 and 917a, August 29, 1895. Parkedale, No. 2929, July 28, 1912. Metamora, No. 6649, July 18, 1923. Variety *Douglasii*, frequently shows a variation with pubescent and glandular ovaries and fruits and this may be known as subvar. *dasygyna* (Rehder) n. comb. Parkedale, No. 2690, June 11, 1912. Rochester, No. 3645, May 26, 1914. Detroit: vicinity of Palmer Park, No. 3956, May 31, 1915. Lakeville, No. 4912, June 2, 1918.

Achillea Ptarmica Linn. Sneezewort or Sneezeweed. An introduction from Europe. Waste grounds at Detroit, rare. No. 3554, October 15, 1913.

Achillea Millefolium Linn. Yarrow. Millfoil. An immensely variable species: caespitose or scattered, from nearly

glabrous to woolly, copiously branched or simple, leaves open and broad to narrow and close, corymbs flat topped to convex, the scales of the involucre vary from uniformly straw colored to almost uniformly brown. The typical form has rather small heads (1.5-2 lines high) with pale brown bordered scales. The rays are rather large, .75-1.75 lines broad. In fields and thickets. Lake Linden, No. 6597, June 25, 1923. Cliff Mine, No. 3913½, October 8, 1914. Eagle Harbor, No. 4005½, July 8, 1915. A variation with scales bordered a very dark brown is var. *nigrescens* E. Meyer. Copper Harbor, No. 4004, July 8, 1915. A variation with larger heads (3 lines high) having the scales bordered a very dark brown, the inner ones acute is var. *borealis* (Bong.) n. comb. (*A. borealis* Bong.) Very scarce in this region. Copper Harbor, No. 5968, August 16, 1921. Another variation, very woolly, with larger rays (up to 3 lines wide) and usually greenish yellow scales, unbordered, (rarely with a pale brown border) is var *lanulosa* (Nutt.) Piper. Occasional throughout the state. Washington, Nos. 6065 and 6006, September 14, 1921. Royal Oak, No. 5587½, August 12, 1920. Another variation has small rays (.5 to 1.25 lines wide) with narrower, more cylindrical heads, the scales uniformly straw colored and is var. *occidentalis* (Raf.) DC. This is the most abundant form of Yarrow in Michigan. Belle Isle, No. 431b, July 23, 1892. Rochester, No. 6970, July 16, 1924. Wayne, No. 7150, July 10, 1924. Erie, No. 6643, July 11, 1923. Romeo, No. 6192, June 21, 1922. Slocum's Island, No. 5985, August 31, 1921. Marl Lake, No. 5710, September 18, 1920. Rochester, No. 4584½, September 2, 1917. A form of var. *lanulosa* with rays from pale rose or pink to dark rose or magenta is *f. rubicunda* Farwell. Previously reported as var. *Asplenifolia*, var. *rosea*, and as A. *lanulosa* f. *rubicunda*. This is probably the *A. Millefolium* var. *rosea* Torr. & Gr., at least in part. Ortonville, No. 6189, June 14, 1922. Romeo, No. 6193, June 21, 1922. Rochester, No. 6932, July 2, 1924. Ypsilanti: No. 1162, June 27, 1891; No. 5288a, July 13, 1919; No. 6217½, June 28, 1922. (I have collected it at Longport, N. J., No. 5902, June 27, 1921. A specimen collected at Birmingham, Alabama, June 4, 1917, by Dr. J. P. Phillips, has the

ultimate leaf divisions ovate and otherwise fits in very well as var. *maritima* Jepson, of the San Francisco Bay region.)

Carpinus Caroliniana Walt. Ironwood. Hornbeam. Blue Beech. This is a small, bushy tree abundant in moist woods and thickets, and along river banks. Said to extend throughout the state, but I have not observed it in the Upper Peninsula. Belle Isle, No. 1273, July 23, 1892. Parkedale, No. 2941, July 28, 1912, and No. 3242, October 27, 1912.

Ostrya Virginiana (Mill.) C. Koch. Ironwood Hop Hornbeam. Similar to the preceding but easily distinguished by the fruits; in the former the bracts are separate but in this they are united to form an inflated sack. The fruiting catkin very closely resembles that of the Hop—hence one of the names. In dry or upland woods. The typical form of the species has pubescent *but not glandular* twigs. It is southern in distribution. Have not observed it in Michigan, which probably is too far north for it. Our plant belongs to the following variety.

Ostraya Virginiana (Mill.) C. Koch, var. *glandulosa* (Spach) C. S. Sarg. The twigs of the season, the petioles and the peduncles are more or less beset with stalked glands. This is the northern form of the species; in the far north the parts involved are densely glanduar; but in the southern part of its range the glands are few and scattered. On the Keweenaw Peninsula where this variety is abundant, the young growths of the season are very densely glandular and have a characteristically reddish sheen due to the red glands, if my memory serves me rightly. Keweenaw Co., No. 88, June 22, 1884; Detroit, No. 88a, August 12, 1899; Parkedale, No. 2730, June 23, 1912; Pittsfield, No. 6205b, June 28, 1922; Newport, No. 6235, July 5, 1922. Mr. C. A. Davis collected it at Alma, May 6, 1891. [In the herbarium of Parke, Davis & Company are two sheets: one with a specimen collected at Shelbourne, Mass., in 1875, by Miss S. E. Anderson; the other shows a specimen from the Torrey Herbarium, without data].

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THE STRUCTURE AND RELATIONSHIPS OF THE TRUE STROMATOPOROIDS[1]

GEORGE B. TWITCHELL

I.—INTRODUCTION

"There is no analogy, however faint, which may not be of the utmost value in suggesting experiments or observations that may lead to more general conclusions."—*John Stuart Mill.*

Reasoning by analogy may not be quite the orthodox manner to be used in reaching scientific conclusions, but to a very great extent paleontological conclusions have been reached in this manner and often cannot be reached in any other way; and this on account of the character of the material at our disposal. This does not apply to the more recent fossils for here our often quite exact knowledge has been obtained by a more complete induction.

Vertebrate paleontology has the advantage of commonly dealing with bones. We have a very correct knowledge of osteology. But even in vertebrate paleontology, especially when we are dealing with lower and older forms, problems arise that can only be tentatively solved, and then only by analogy.

Again in invertebrate paleontology conchology, founded on the easily studied modern shells, offers an excellent guide to the study of fossil shells. Other examples could be offered in which a strict orthodox induction has led to very exact conclusions; but there are an enormous number of fossils in which all we have to guide us in our studies are faint analogies with living forms. Here a paleontologist without a good imagination is lost.

Faint analogies should not be neglected. Their careful study often leads to the discovery of other analogies either

[1] Contributions from the University of Cincinnati Museum. Geology and Paleontology. Number 7.

strengthening or destroying the conclusion first suggested. The mind should be held open for either event for "analogy, as we know, is a good servant but a bad master; when master it does more to blind than it may previously have done to illuminate."

The stromatoporoids present a very good example of fossils whose place in the scheme of nature has been determined by faint analogy; an analogy that at times does not extend throughout the group for the stromatoporoids, as usually considered, make up a heterogeneous series of fossils probably belonging to widely different classes. Some may have been algae. Naturally different observers were impressed by different analogies and so these fossils were shunted from one biological group to another.

II.—HISTORICAL REVIEW

Goldfuss, who founded the genus *Stromatopora,* (Petrefacta Germaniae, Bd. 1, p. 21, 1826), gave it a place between the millepores and the madrepores; d'Orbigny, (Prodrome de Paleontologie, 1850), classed the stromatoporoids with the sponges, the Sandhegers, (Die Versteinerungen des rheinischen Schlichten systems in Nassau, p. 380, 1850-56), thought them bryozoans as did Roemer, (Lethaea Geognostica,[2] 3rd ed., vol. 1, p. 166, 1851-56), who later, however, classed them with the tabulate corals.

What Nicholson calls "one of the most important contributions to the study of Stromatoporoids" was published by Baron von Rosen in 1869 under the title "Uber die Natur der Stromatoporen, und über die Erhaltung der Hornfaser der Spongien in fossilen Zustande."

Baron von Rosen went beyond faint analogies and attempted by the means of microscopic study of thin sections to establish a more complete induction and thus find the proper affinities of the stromatoporoids. The splendid plates in his work deal largely with the minute structure of the skeleton. Baron von Rosen concluded that the stromatoporoids were horny sponges that had become calcified.

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[2] In 1883 in the second part of his Lethaea Palaeozoica Roemer placed the stromatoporoids among the Hydrozoa.

We may not accept, in its entirety, von Rosen's conclusion, but we must admit his methods of study were correct.

Stromatoporoids have been referred to sponges other than the *Ceratospongiae.* Salter, (Catalogue Silurian Fossils, p. 99, 1873), considered them calcareous sponges. In 1878 Nicholson and Murie published a paper on "The Minute Structure of the Skeleton of *Stromatopora* and its Allies," (Journ. Linn. Soc., vol. 14, 1878). In this paper they conclude from the then available evidence that the stromatoporoids may be best regarded as a separate section of the calcareous sponges, for which they proposed the name *Stromatoporoidea.* They did not establish any biological connection between the stromatoporoids and the recent calcareous sponges. This left the matter in a very unsatisfactory state for such a group would have to be founded solely on imagination without the help of analogy. Sollas, (Ann. Mag. Nat. Hist., ser. 4, vol. 19, 1877), placed the genus *Stromatopora* among the siliceous sponges, (Hexactinellida).

Before we come to the generally accepted idea of the hydrocoralline affinities of the stromatoporoids it should be mentioned that they have been classed even with the Foraminifera. Dawson in the "Dawn of Life" (1875) and later in a memoir on "The Microscopic Structure of the Stromatoporidae," (Quart. Journ. Geol. Soc., vol. 35, pp. 48-66, 1879), so considered them.

The idea that the stromatoporoids make up an extinct group of hydrocorallines is founded on analogies that do not extend throughout the group.

Carter, (Ann. Mag. Nat. Hist., 1873 and later), devoted a great deal of attention to the study of various species of *Hydractinia;* and as a result of this study became impressed with the similarity of the skeleton of *H. echinata* to that of *Labechia,* (following M. Heinrich *Labechia* is not recognized as a true stromatoporoid in this paper) ; to a lesser degree this analogy also extends to *Actinostroma,* (a true stromatoporoid) but here the analogy ceases.

The resemblance between *Labechia* and the various species of *Hydractinia,* recent and especially fossil, to me is very striking; Nicholson, however, after pointing out many dissimilar-

ities, concluded that "the resemblance between the *Labechiidae* and *Hydractinia echinata* does not appear to me to be nearly so close as it is in the case of the *Actinostromidae*," (Monograph of the British Stromatoporoids, p. 69). With this I cannot concur and even Nicholson admits that "it is only with a particular section of the Stromatoporoids, (*Actinostromidae*), that the likeness is at all very conspicuous," (Monograph of the British Stromatoporoids, p. 68).

The groves on the surface of a *Hydractinia*, (Plate XX, Fig. 2), are not homologous or even analogous to the astrorhizal canals of a stromatoporoid. *Labechia* has no astrorhizal canals.

The analogy of the stromatoporoids with *Hydractinia* proved insufficient to establish a hypothesis, but it lead to the discovery of other analogies.

Millepora, largely on account of its porous coenosteum, was looked upon as presenting a structure analogous, if not homologous, to many of the stromatoporoids.

Millepora has tabulated zooidal tubes, and consequently such tubes, to make the analogy complete, had to be found in stromatoporoids. Little advance would be made in science without the use of working hypotheses: but there is always danger that enthusiasm for the hypothesis may lead to the unconscious manufacture of evidence in its support.

Carter, (Ann Mag. Nat. Hist., ser. 5, vol. 2, p. 304, 1878), suggested that caunopora tubes housed polyps and were comparable to the gastropores of *Millepora*. Vertical sections through *Millepora* including gastropore tubes and vertical sections through a stromatoporoid including caunopora tubes, (Plate XIX, Figs. 4-5), often present a most remarkable similarity; a similarity as striking as that of *Favosites* to a honeycomb, but the analogy is as faint in one as the other.

Carter did not long hold to this view; in a paper, (Ann. Mag. Nat. Hist., ser. 5, vol. 1, p. 339, 1880), he described a stromatoporoid from Devonshire having tabulae in the branches of the astrorhizae. These tubes he considered similar to the tabulate tubes of *Millepora*. His conclusion that the millepore zooid emerged from the astrorhizal canals, probably, I suppose from the astrorhizal centers, did not receive recognition.

I believe it can be demonstrated that the structures described by Carter are not tabulae; but even so, if the stromatoporoids were hydrocorallines, these astrorhizal centers and cylinders would be the only places in the coenosteum from which polyps could emerge: then the astrorhizal canals would be the coenosarcal tubes. An idea hardly to be accepted.

Nicholson, (Monograph of the British Stromatoporoids), rejecting Carter's conclusion, described what he thought to be the zooidal tubes needed to establish the coelenterate affinities of the stromatoporoids.

Vertical sections of the various species of *Stromatopora* present pictures strongly suggesting that the stromatoporoid was made up almost entirely of tabulate tubes. Nicholson discusses this at length and concludes that these sections demonstrate the presence of the required zoöidal tubes.

But they are not tubes; what is seen in the section are the open spaces between pillars. G. Steinman in 1903, (*Milleporidium*, etc.), strongly questioned the existence of the so-called "zoöidal tubes," and even the conservative Parks, (Silurian Stromatoporoidea, 1909), looked upon them with doubt.

We are really left in the same position as when Nicholson wrote: "The great difficulty which many observers have felt in the way of accepting the reference of the stromatoporoids to the *Coelenterata* is that no clear demonstration had been made of the existence in the skeleton of any tubes which might have lodged the zoöids of a Hydrozoan or Actinozoan colony. It was this difficulty which induced me previously to adhere to the reference of the group to the *Rhizopoda*." (Monograph of the British Stromatoporoids, p. 49.)

Nicholson's Monograph left the question of the stromatoporoid affinities in an unsatisfactory state, but did establish a generally satisfactory working classification. He included in the group many fossils that later study will probably relegate to other groups, and many of his interpretations of structure will be modified or entirely discarded, but many years will pass before this Monograph will cease to be indispensable to the student of stromatoporoids.

In 1907-1910 W. A. Parks, (University of Toronto Studies,

Nos. 4-7), published a series of studies of the stromatoporoids of the Guelph in Ontario, the Niagara, the Silurian of America and the Ordovician. In general his ideas adhere very closely to the teaching of Nicholson; here and there, however, throughout his papers a doubt as to the correctness of the accepted plan of architecture is suggested, but no better plan is proposed, nor is any effort made to limit Nicholson's heterogeneous assembly by excluding from the group organisms that may be far removed from the real stromatoporoids.

The work of Parks is very valuable in putting on record new species, providing more material for generalization. Parks, in these papers, found three new genera, *Dermatostroma, Aulocerium* and *Actinodictyon.* The first two are not true stromatoporoids but possibly related to *Labechia;* the third, a true stromatoporoid, will prove valuable in the discussion of structure.

Among the publications, limited to single genera or species, here and there will be found one in which the genus or species is removed by the author from the stromatoporoids considered as a hydrocoralline group.

Raymond, (Bull. Victoria Mem. Mus., 5, p. 8, 1914), described a fossil (*Cryptophragmus antiquatus*) from the Black River as an alga. This fossil seems to be the chambered inner tube of a *Beatricea* common in the upper Richmond. Shideler, in a paper read before Section E of the American Association for the Advancement of Science, 1919, offered strong presumtive evidence that the chambered inner tubes of *Beatricea* are plants. He described what he concluded were "fruiting bodies." Shideler's opinion is that *"Beatricea"* is a chambered alga with a stromatoporoid, (to which he restricts the name *Beatricea*), growing on it. This stromatoporoid grows also on *Stromatocerium* and other objects; it may be identical with *Aulocerium* Parks. In 1865 Hyatt, (Amer. Journ. Sci. and Arts), expressed the opinion that *Beatricea* belonged to the Cephalopoda.

Aside from this work on *Beatricea,* (although here and there it was suggested that the stromatoporoids were not a natural group), little was done to find definite affinities for

individual genera and no critical examination made to find how the various organisms could be related to one another. Hydrocoralline affinities were assumed for all.

In 1914 M. Heinrich, (N. Jahrb. für Min. etc., No. 23, pp. 732-36, 1914; translated by Clara Mae LeVene, Journ. Geol., vol. 24, p. 57, 1916), in a paper on the Structure and Classification of the Stromatoporoidea, greatly simplified the entire problem by selecting from the hodge podge of fossils called stromatoporoids a group of closely allied genera which he called the "true stromatoporoids."

The discussion to follow will deal entirely with Henrich's true stromatoporoids and leave for future consideration the many excluded genera.

III.—CAUNOPORE TUBES

Certain peculiar structures, the caunopore tubes, are commonly associated with stromatoporoids. The history of the various ideas that have been held as to their nature is closely associated with the history of stromatoporoid study.

A digression may be here permitted to take up this matter for with their elimination as integral parts of stromatoporoids they will find no place, aside from an ecological suggestion, in a theory of structure to be offered in this paper.

In 1841 Phillips, (Pal. Foss. of Cornwall, 1841), founded the genus *Caunopora* for two species of fossils *C. placenta*, (*Coscinopora placenta* Lonsdale), and *C. ramosa* Phillips; *C. ramosa* is now recognized as belonging to the genus *Amphipora* Schulz. *Amphipora* is not a true stromatoporoid according to the Heinrich definition recognized in this paper.

The generic name *Caunopora* has given rise to the term caunopore tubes, (Caunopora tubes of Nicholson). These tubes are most common in species of *Stromatopora* and *Stromatoporella;* but they are also to be found in other genera. Bargatzky, (Die Stromatoporen des rheinischen Devons, 1881), gave the generic name *Diapora* to the tube bearing stromatoporoids of these other genera, i. e., to the genera of colonies in which the tubes are included in a mass made up of concentric laminae and distinct radial pillars.

The typical caunopore tubes are usually thick walled with an internal cavity narrowed or nearly obliterated by a light colored dense deposit. The walls may be thin and the secondary deposit scant or absent. The tubes are often tabulate. The tabulae may be straight, curved or funnel shaped; so-called vesicular tabulae are not uncommon. Caunopore tubes with septal spines have been described. In general the tubes arise from irregularly horizontal stolons and extend at right angles through the laminae of the entire mass to open at or slightly above the surface. The vertical tubes may give off branches to communicate with neighbors or bend upward to form new vertical tubes. The vertical tubes are often very regularly spaced throughout the entire stromatoporoid or arranged in colonies; single, isolated branching tubes, however, are not uncommon.

Nicholson, in a Monograph of the British Stromatoporoids devotes a chapter to "The Nature of Caunopora." In this discussion he presents three theories "(1) The view that '*Caunopora*' and '*Diapora*' are genera of Stromatoporoids; (2) the theory of Roemer that '*Caunopora*' and '*Diapora*' are the result of the commensalism of certain Stromatoporoids with certain corals; and (3) the theory that the 'tubes' of '*Caunopora*' and '*Diapora*' belong to the organism in which they are found, but that they represent structures which are only developed in certain colonies or in certain individuals, and that these names, therefore, merely indicate a *state* of certain Stromatoporoids."

Nicholson in discussing the first theory offers what seems to me conclusive proof of its untenability. The genus *Caunopora* is still recognized, however, if but in a half-hearted way for we read in Zittel, (Text-Book of Paleontology, 2nd ed., vol. I, p. 123, 1913): "In other cases, however, the tubes appear to have been formed by true Stromatoporoid polyps." It is strange how long it takes to bury a dead idea.

The third theory seems also to have some adherents. A recent author, (Parks, Niagara Stromatoporoids, Plate 7, Fig. 8, 1908), speaks of "*Caunopora* States." There is no similarity between caunopore tubes and the tabulated tubes of

Idiostroma, Stachyodes and *Amphipora.* These three genera, however, are not "true stromatoporoids." It has been suggested that the tubes lodged reproductive polyps—pop guns for shooting out the pseudo-medusae of milleporoids. The very oddity of the idea is attractive. We like to make strange creatures out of the animals of the past.

The second theory, the commensalism theory of Roemer, I shall discuss more fully for it naturally leads to what I believe to be the true explanation.

As a rule commensalism among fossils can only be inferred. The constant close association of two species of different families may be considered strong presumptive evidence. A striking example of such association is found in the Ordovician bryozoan *Leptotrypa ornata* and the gastropod *Cyrtolites ornatus.* The bryozoan is found on this gastropod and nowhere else. According to Ulrich nine out of ten of these shells, in the Corryville of the Cincinnatian, are covered with the bryozoan. Whether these shells were living or dead when the bryozoan growth occurred we do not know. *Hydractinia* covers dead gastropods which are inhabited by hermit crabs. If commensalism exists, as is usually presumed, it exists between the hermit crab and the *Hydractinia;* not the gastropod and the *Hydractinia.* We can only speculate when we consider Ordovician commensalism.

Fossil bryozoans encrust other bryozoans, crinoid stems, corals, cephalopods, etc., and each species, or at least each genus, seems often to have a particular choice, selecting over and over again the same organism to encrust, but this is far from commensalism.

Corals and hydrocorallines, fossil and recent, encrust and even totally envelop other organisms. Encrusting forms often have as well developed epithecae as do the apparently free forms; so encrusting is probably, in most cases, an accidental environmental condition.

The encrusting and enveloping of foreign organisms is as common with the stromatoporoids, (Plate XX, Figs. 3-4), as it is with corals and bryozoans; but there is in the stromatoporoids an enveloping that goes beyond what occurs in colonies of corals or bryozoans. The connection between the

stromatoporoids and the enveloped organism is much more intimate, so intimate indeed as to have given rise to the idea that the enveloped organism was an essential part of the stromatoporoid.

In colonies of corals or bryozoans it is essentially the base that is in contact with the foreign body. The base or epitheca of a stromatoporoid is frequently very small so that an enveloping, rather than an encrusting, occurs. The walls of polyps or zooids may be closely applied to a foreign body enveloped in the coenenchyma but in the stromatoporoids the foreign body, caunopore tube, is actually in the living chamber for interlaminar spaces, as we shall see later, may be looked upon as essentially living chambers of sponges. It is not strange that symbiosis or at least commensalism should have been suggested as an explanation of this condition.

Readily recognized corals, (Plate XX, Fig. 3-4), are often enveloped by stromatoporoids in the same way that caunopore tubes are enveloped; typical caunopore tubes often have an internal structure strongly suggestive of *Aulopora* and *Syringopora*, but not to my knowledge of recognized species of these genera. Roemer in his theory of commensalism finally looked upon *Aulopora* as the important commensal.

Even the typical caunopore tubes, (Plate XVIII, Fig. 3-5), are not always like *Aulopora* or *Syringopora*. A tube, or colony of tubes, without tabulae or septal spines and nearly closed with light colored parenchyma, if found unassociated with a stromatoporoid would in all probability be considered a fossil alga. Even more suggestive of algae, (Plate XVIII, Fig. 1), are delicate organisms, almost walless and dichotomously or monopodially branching, that are enveloped by the stromatoporoid precisely as are the typical tubes. Such alga-like forms are not very uncommon, (Plate XVIII, Fig. 1).

If we consider commensalism as the *raison d'etre* of "caunopora tubes" we must look upon the stromatoporoids as very generous and broad-minded, receiving as partners corals, bryozoans, worms and algae. No sharp line can be drawn between the tubes of the genera *Caunopora* and *Diapora*, and the great variety of isolated tubes found in stromatoporoids everywhere.

Perhaps we may infer commensalism in some few instances, but to me the more logical explanation is that the stromatoporoids in life had a delicately growing structure readily encompassing neighboring organisms without distorting them in any way and perhaps preserving some that under other conditions would be entirely lost. Only a very few fossils that closely resemble caunopora tubes are found in the stromatoporoid bearing rocks. These are easily preserved corals.

The delicate growing tissue of a sponge later reenforced by spicules is especially adapted to envelop and preserve neighboring organisms, (Plate XXVI, Fig. 1). The structure of a sponge is such, that included foreign bodies can extend through the entire mass and be very intimately associated with it, without in any way affecting its economy. As a sponge grows even a paragastric cavity can be formed with a foreign body, lined of course with sponge tissue, in its center, (Plate XIX, Fig. 1 and Plate XVIII, Fig. 4). In a broad sense the paragastric cavities, as we shall see later, analogous to the interlaminar spaces of stromatoporoids, are the living chamber of sponges.

This very intimate association of different organisms, without any suggestion of commensalism, is common among fresh water sponges and bryozoans, (Plate XVIII, Fig. 2). The best way to find the delicate little bryozoan *Pottsiella erecta* is to hunt for encrusting sponges especially *Trochospongilla*. The living bryozoan will be found piercing the sponge. Other bryozoans will then be found on the rocks about the sponge. The locality was favorable for the growth of either.

Of course, this is not the only bryozoan that may become enveloped by sponge growth. Algae are also frequently included.

According to Parker and Haswell, (Text-Book of Zoology vol. 1, p. 127, 1910), the same conditions of life are to be found in marine sponges. "Frequently a Sponge and a Zoophyte grow in intimate association, so that they seem almost to form one structure. Sponges often also grow in very close association with certain low forms of plants (algae)."

With the exception of plants, especially fungi, sponges are the only modern forms of life that include foriegn organisms in any way analogous to the inclusion of caunopore tubes in stromatoporoids.

The ecological implication presented in this digression may not be entirely convincing, but it serves to present my thesis that the true stromatoporoids were sponges.

IV.—HEINRICH'S DEFINITION

M. Heinrich, with very good reasons, excluded from the stromatoporoids the genera *Amphipora*, *Stachyodes*, *Idiostroma*, *Labechia*, *Rosenella* and *Beatricea*. Exclude these genera and we have a group of very closely allied fossils.

Heinrich still adheres to the Nicholson classification recognizing the two families *Actinostromidae* and *Stromatoporidae*, but not as hydractinoid without and milleporoid with tabulated zooidal tubes; for with Heinrich zooidal tubes analogous to those of *Millepora* do not exist. The distinction that Heinrich makes between his two families lies in the structure of the fibres. The *Stromatoporidae* have non-massive, (porous or perforate), fibres. The *Actinostromidae* have massive fibres. This structure will be more fully discussed later.

The two families that Heinrich makes may or may not be natural divisions, but what he calls the "true *Stromatoporoidea*" surely make up a natural group.

Heinrich offers the following definition of the "true *Stromatoporoidea*": "The skeleton is built up of seamlessly united, massive or porous calcareous fibres, which form a more or less regular network. In this can be recognized a more or less plainly layered arrangement of the tangential elements. Astrorhizae are always present." This last sentence is of vital importance, for a study of the astrorhizae or better of the astrorhizal systems, will show that all of these stromatoporoids are built upon one definite general plan. This plan is also the plan of the simplest form of rhagon sponge.

V.—THE ASTRORHIZAE

Stromatoporoids are often covered with tracings, making designs that add beauty to otherwise unattractive fossils.

These are the astrorhizae. They are not always visible on the surface; sometimes they are lost in weathering and sometimes are covered with what is called a dermal layer. Possibly they are only visible when this layer has been lost by weathering or destroyed before fossilization. When they are in evidence they assume very characteristic forms.

As seen on the surface of a stromatoporoid the astrorhizae present groups of meandering canals. These groups, they may be called colonies, cover the entire upper surface. The canals of each group radiate from a center like rootlets from a central stem, hence the name; the center, however, is actually like the canals, an open space. The canals, like rootlets become smaller and smaller as they leave the center; in their course they communicate with each other and finally inosculate with the terminal branches of adjoining astrorhizae, (Plate XX, Fig. 6.).

The astrorhizae on the surface of a stromatoporoid are often more or less covered with a dermal layer. In well preserved specimens of *Stromatoporella granulata* this layer is very distinct. Often the layer seems imperforate, but in *S. granulata* it is pierced with numerous small pores, (Plate XXII, Fig. 6) ; this is probably the normal condition in life; pores are easily lost in fossilization. The entire dermal layer may be lost in fossilization. It is hardly likely that, except through accident, one stromatoporoid should have a dermal layer and another, in every other way of similar structure, should be without what seems an important element. Stromatoporoids with an astrorhizal system hidden by a dermal layer retain an opening that can be shown by grinding to be an astrorhizal center.

Nicholson, following Carter, considered the astrorhizae analogous to the coenosarcal grooves on the surface of *Hydractinia* and the inosculating canals of *Millepora*. In the hydrocorallines coenosarcal tubes establish a connection between the polyps but do not radiate from a center as do the astrorhizal tubes. In the astrorhizae the center is the important element of the system, the tubes become more and more indistinct and smaller as they leave it. The coenosarcal tubes of *Millepora*

or *Hydractinia* are of practically uniform size throughout, (Plate XX, Figs. 1-2). This is the weak point in Nicholson's analogy. Nicholson's own figures in his Monograph show this very plainly.

It is not in the hydrocorallines that structures analogous to astrorhizae are to be found.

Sponges have structures in every way analogous to the astrorhizae of stromatoporoids. This is most distinct in those fresh water sponges that have the simplest form of rhagon structure. All that has been said of the astrorhizae of stromatoporoids will correctly describe the astrorhizae of these sponges, (Plate XX, Fig. 5).

Just as in the case of many and probably all stromatoporoids, the astrorhizae of sponges are covered with a perforated dermal layer. This is so thin that the astrorhizae can be seen through it, (Plate XXII, Fig. 4). At the center of an astrorhizal system is an osculum uncovered by the dermal layer.

Astrorhizal systems occur in each layer as we go down through the mass of the stromatoporoid. Of course below the surface they are always covered and become tunnels. Just as in the astrorhizae on the surface, the tubes are largest and most distinct at the centers. At the periphery where the system inosculates with adjoining systems the tubes become lost in a maze of the pillars of an interlaminar space.

At the center of each of these covered astrorhizal systems, is an opening, (Plate XXI, Fig. 1). When, as is often the case, the astrorhizal systems of the different layers are superimposed, this opening becomes the common orifice of a number of astrorhizal systems from as many interlaminar spaces. Nicholson in describing this arrangement uses the term "astrorhizal cylinder," (Plate XXII, Fig. 5). When the astrorhizal systems are not superimposed a large astrorhizal branch, like the stolon of a strawberry plant, branches off to connect with the center of another system of a lower level, (Plate XX, Fig. 7). This condition is not always easy to demonstrate, usually the grinding of many sections is required for the purpose.

In the more delicate species, such as *Clathrodictyon vario-*

lare, the astrorhizal plan can only be determined by the study of sections; but in coarser forms, such as *Stromatopora monticulifera*, a hand lens is sufficient to show the entire structure in horizontal fractures, as these naturally follow the weak, open, interlaminar spaces. Such a fracture will show the tracings of the astrorhizal canals on both upper and lower surfaces, and between the canals and beyond their limits, projections produced by the pillars, now broken, that connect the laminae, (Plate XXI, Fig. 2). All of the spaces between the pillars are in free communication with each other and are indeed nothing but the ultimate ramifications of the astrorhizal canals. The whole arrangement may be likened to a field of stumps through which pass winding and branching roadways.

The astrorhizal canals have no well developed walls except perhaps where they converge to a center that communicates with the outer world.

In addition to the large openings at the confluence of astrorhizae the laminae have innumerable pores, (Plate XXI, Fig. 4). They are not always easy to recognize for they are often closed by mineralization; but when they are distinct it becomes apparent that they also connect the interlaminar spaces with the external world. They are analogous to the incurrent canals or ostia of sponges; then the astrorhizal canals would be analogous to excurrent canals converging to a central paragastric cavity.

The more or less constant arrangement in layers indicates a certain periodicity of growth upward, while the lateral growth may be continuous. Each layer includes a number of astrorhizal systems. Each system makes up a biological unit. These units are in communication with each other: laterally by the intermingling of the ultimate ramifications of the astrorhizal canals, vertically by the astrorhizal cylinders or stolons.

When so considered the definite general plan suggested becomes apparent, for it is the arrangement of these biological units that is constant throughout both milleporoid, (*Stromatoporidae*), and hydractinoid, (*Actinostromidae*) groups.

If what I have designated the biological unit of a stroma-

toporoid be considered by itself, we see in it the structure of a rhagon in which the paragastric cavity has become modified resulting in the formation of pillars and astrorhizal canals. When this modification, (the result of folding), is slight a vertical section will show a very close approach to the theoretical idea of a primitive rhagon, (Plate XXII, Fig. 3).

VI.—THE RHAGON

A simple rhagon has large paragastric cavity opening to the exterior by an osculum. Over the entire upper surface, about this osculum as a center, are numerous ostia—the open-

Fig. 1

FIG. 1.—A diagramatic section of a simple rhagon sponge. O, osculum; P, paragastric cavity; ciliated chambers open into the paragastric cavity by exhalant pores, (apopyles). Inhalant pores, (prosopyles), not shown. (After Keller, from Minchin.)

ings of incurrent canals which communicate directly with the ciliated chambers; from these chambers the excurrent canals pass into the paragastric cavity. "In the *Rhagon* proper the arrangement of parts is very simple. The Sponge has a paragastric cavity opening on the exterior by an osculum. Opening into this central cavity by wide apopyles are a number of rounded chambers, each communicating with the exterior by an inhalant pore (prosopyle)." (Parker and Haswell, Text Book of Zoology, vol. 1, p. 119, 1921.)

The ideal rhagon does not exist as an entity in nature; but certain of the fresh water sponges approach it very closely,

(*Spongilla and Trochospongilla*). These sponges have a structure very like that of many of the stromatoporoids and vary from the ideal of a simple rhagon in much the same way that the stromatoporoids do.

A unit of *Spongilla fragilis,* (Plate XXII, Fig. 4), varies from the simple rhagon plan by having the whole sponge, except at the osculum covered with a delicate dermal layer held up by spicules like tent poles. This establishes a subdermal cavity above the true ostia, i. e., above the true rhagon. The rhagon itself is no longer made up of a simple paragastric cavity lined with ciliated chambers; folding has differentiated

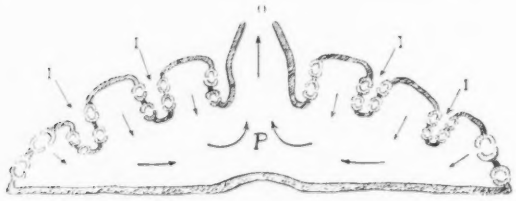

Fig. 2

FIG. 2.—Diagramatic section of a rhagon in early stages of folding. O, osculum; P, paragastric cavity; I, inhalant tubes; exhalant tubes open into the paragastric cavity.

the cavity into large excurrent tubes and cavity much after the plan of a stromatoporoid astrorhizal system even to the extent of forming definite pillars. The resemblance between the pillars about a paragastric cavity in the sponge and those about the cavity of a stromatoporoid is very striking, (Plate XXII, Figs. 1-4).

It may be hard to understand how folding can produce some of the complicated patterns of tubes, excurrent and incurrent, found in many sponges. A study of the simpler forms of folding as exhibited in *Spongilla* and indeed in the stromatoporoids will help solve this problem. The first result of fold-

ing in a rhagon is to increase the area of the surface which carries ciliated chambers; later the paragastric cavity is limited to a space no longer lined with ciliated chambers; the larger of the astrorhizal tubes in *Spongilla*, (Plate XXI, Fig. 3), are also not lined with ciliated chambers and may be considered either extensions of the paragastric cavity or extensions of the excurrent tubes. The ciliated chambers are to be found among the smaller tubes lost in the maze of pillars about the periphery of the true paragastric space.

The folding in of the choanosome of a rhagon producing the astrorhizae and pillars of a *Spongilla* or a stromatoporoid would naturally leave on its surface marks of a negative folding often simply in the form of depressions over pillars; the incurrent tubes are formed by this negative folding.

The tracings seen of a negative folding might be called negative astrorhizae. They may consist of small pores entirely covering a surface of a section without any definite design, (Plate XXI, Fig. 4), or arranged in patterns that have been described as astrorhizae; a careful study of the specimen producing them will always also show true astrorhizae. This will explain the different appearance of horizontal sections at different levels. At times, though rarely, the astrorhizae seen on the surface of a stromatoporoid are negative astrorhizae. The surface of a *Clathrodictyon* is covered with small vermiculate grooves, (negative astrorhizae), under which true astrorhizae can be demonstrated by section.

The essential difference between negative astrorhizae and true astrorhizae is that the true astrorhizae communicate directly with the paragastric cavity. A folding will leave indentations both above and below the folded surface of a rhagon. This surface has an opening, the osculum, (O. of Fig. 2), which is not affected by the folding, while the numerous small pores, prosopyles, are carried down by each fold that encroaches upon the original simple paragastric cavity. The spaces between the folds dipping down into the paragastric cavity form canals which, through the cavity, communicate with the osculum. On the surface of the rhagon the depressions caused by folding do not extend quite to the osculum, (Fig. 2).

Negative astrorhizae are smaller than the true ones and form less distinct canals because of the character of the folding; they may be simply small pores easily lost in mineralization.

In *Clathrodictyon cellulosum* and *C. striatellum* folding is very distinct. The open triangular-shaped spaces shown in the vertical sections, give the appearance of pores in horizontal section. It is evident that a horizontal section just below the upper lamina, demonstrating negative astrorhizae, would give a very different picture from that produced by a section just above the lower lamina passing through the true astrorhizae, (Plate XXVI, Figs. 3-4-5).

The formation of pillars in *Clathrodictyon* has been described as a folding by both Nicholson and Parks who do not recognize any connection between sponges and stromatoporoids.

VII.—MODIFICATIONS OF THE RHAGON STRUCTURE

The paragastric cavities of stromatoporoids so far considered have been of a primitive rhagon type; but this is not always the case, notably, in some species of *Actinostroma*.

In Nicholson's classification, the family *Actinostromidae* included the genera *Clathrodictyon*, *Actinostroma* and *Stylodictyon*.

Actinostroma has continuous pillars, i. e., pillars passing through several laminae, while *Clathrodictyon* has pillars limited to one interlaminar space.

The genus *Actinostroma* cannot be so lightly defined if we give to the astrorhizal systems the importance which I believe they should have. In some species of this genus the plan of the astrorhizal systems is such as to suggest that the growth is *Clathrodictyon*—like except for the continuous pillars; the mass is made up of thin units placed one on top of another. Some species have astrorhizal cylinders that have the structure of the cylinders, (columns of Nicholson and others), of *Stylodictyon;* while in one species at least the paragastric cavity approaches closely in form that of the modern sponge *Chalina*.

The species in question is a undescribed form of *Actinos-*

troma from the Niagaran. In it the paragastric cavity, (Plate XXIII, Fig. 6), consists of a branching tube extending down into the stromatoporoid. The walls of this tube are inflected making ridges, trabeculae, into the lumen; these are set at various angles. The branches have practically the same diameter as the main tube. Excurrent canals from the interlaminar spaces communicate with the tube, (paragastric cavity), at all levels. We have more precisely the arrangement of the paragastric cavity of the marine sponge, *Chalina arbuscula*, (Plate XXIII, Fig. 5).

In addition to this similarity it will be noticed that the spicules of *Chalina* are arranged on the plan of the pillars and laminae of *Actinostroma*. It was this structure of the pillars and laminae of *Actinostroma*, (Plate XXIII, Figs. 5 and 6), that led Nicholson to admit that the arrangement of pillars and laminae of some stromatoporoids did suggest a spicular meshwork.

A lamellar form of growth does exist in *Astinostroma* but it is often difficult to determine the exact limits of the lamellae. The laminae are usually not plates but arms extending from the pillars like spokes from a wheel. They are often double but even this does not always seem to mark the limits of lamellae. The resemblance of *Actinostroma* to *Chalina* might suggest that no lamellar structure existed in the stromatoporoid but this is not true.

VIII.—THE LAMELLAR STRUCTURE

In the stromatoporoid, as in the sponge, each osculum may be considered the center of a unit that is in intimate association with all surrounding units; in the stromatoporoid, however, the connection between units is much simper than in most modern sponges; there is a reguarity about it that does not seem sponge-like. This is especially true of the lamellar structure. So far as I know there is but one sponge, the fresh water *Trochospongilla leidyi*, that is built on this plan.

Potts, (Fresh Water Sponges, a Monograph. Philadelphia, 1887), in commenting on Dr. Bowerbanks' original description of *Trochospongilla leidyi* presents the following—"*Persistent;* the growth of successive seasons forming as many series of

thin laminae. Surface even, sometimes rising into smooth rounded prominences, and at times covered with singular radiating or bird-track-like markings, whose cause is not fully understood. Pores and osteoles numerous, minute; the latter being found along the radiate lines, but not conspicuous at their confluence. Texture very compact; composed of short spicules, very slightly fasciculated; the primary lines and principal channels nearly perpendicular; with single intercalating spicules forming polyhedral interspaces."

The outer layers of *T. leidyi* retain the spicular structure just described but the lower layers are so crowded with statoblasts that it is largely lost.

The "plainly layered arrangement" of stromatoporoids indicates the periodicity of growth previously mentioned. A periodicity of growth does not mean that the new layer alone contains the active living elements as may be the case in other organisms growing periodically. The intimate association of all units with each other would suggest that all alike retained their vitality. This is true of the laminar sponge *Trochospongilla*. This being the case we must not always expect to find sharp boundaries between the layers.

A periodical growth is limited to the thickness of the astrorhizal systems spread out in one place. These limits are often sharply marked by what may well be called laminae; but where the horizontal elements are discontinuous or curved several may exist in the thickness of a lamella, so that we must look to the arrangement of the astrorhizal tubes for a guide to the limits of periodic growth.

The limits of a period of growth even where the arrangement of horizontal astrorhizal tubes is distinct, cannot always be definitely determined but is often suggested by a difference in the structure along a certain level. There may be a layer of crowded laminae separated by small irregular spaces differing from the spaces produced by the ramifications of the astrorhizal tubes, or the laminae may be distinctly double.

The dermal layer of *Trochospongilla horrida* is thick and made up of layers of closely approximated spicules arranged horizontally. They are bound together by a minimum of or-

ganic material. In sections this layer appears distinctly double, (Plate XXII, Fig. 2).

Had *Trochospongilla horrida* the habit of periodic growth like its cousin *T. leidyi*, laminae would be formed throughout its mass and these laminae would be double, like those often seen in species of *Actinostroma* and at times in other genera.

It is altogether likely that in the stromatoporoids the dermal layer was often preserved in fossilization and in the fossils, as we now see them, served to show the limits of periodic growth.

The founding of a lamellar structure on indefinite plates, (laminae), has led to much misunderstanding of the architecture of different genera of the true stromatoporoids. Perhaps the most notable of such misconceptions occurs in the recognized definition of the genus *Stromatopora*, the genus whose name gave a name to the group.

Nicholson, in his description of the genus *Stromatopora*, says: "Concentric laminae are usually very imperfectly developed. The growth is very commonly by latilaminae, the radial pillars being continued from the top to the bottom of each latilamina."

A latilamina, as defined by Nicholson, is made up of a series of laminae and interlaminar spaces or better lamellae. A lamella is made up of a number of units in one plane. These units after spreading in one plane develop a similar growth above the first layer, then above the second and so on until a series of lamellae is formed. A change in the environment would cause a cessation of growth. Later through a regeneration, another series of lamellae would be superimposed. A number of such series often go to make up a stromatoporoid. These are the latilaminae.

Interesting as this regeneration may be, it is not a matter of vital importance in the structure of the organism. Many of the trepostomatous bryozoans have a similar mode of growth. A large example of *Amplexopora filiasa* is distinctly latilaminate.

In the genus *Stromatopora* an astrorhizal system is not spread out flatly through a shallow layer but branches irregu-

larly through a rather thick interlaminar space, not a latilamina. As Nicholson notes "pillars more or less broken extend from the base to the top and laminae are not distinct." The break between latilaminae, *sic*, in *Stromatopora* is no more distinct than the break between ordinary laminae. A latilamina in *Stromatopora* is simply a thick lamina or better lamella.

The term latilamina should be dropped entirely and lamina should be used only to designate plates, which may or may not limit lamellae. In this paper and in descriptions of stromatoporoids to follow the term lamella will be used in describing the layers of units that go to make up a stromatoporoid.

IX.—TRABECULAE

Stromatopora is the genus in which "tabulate tubes" are most apparent and on which Nicholson founded his idea of the hydrocoralline affinities of the group. Vertical sections do suggest the presence of tabulated tubes, but cross sections show that what appear to be the walls of tubes are in reality pillars. This alone should rule out the tube idea.

In some species of *Stromatopora*, (notably *S. antiqua* and *S. typica*), vertical sections show delicate granular lines horizontally crossing the spaces between pillars at quite regular intervals. These lines are frequently crowded, leaving but little space between them. In other species, not of *Stromatopora* alone but even of such a genus as the "hydractinoid" *Actinostroma*, what appear to be identical structures take very irregular courses. They cross the open spaces between pillars, and the astrorhizal canals at all angles. In *Stromatoporella*, (Plate XXIII, Fig. 2), they are particularly abundant in the astrorhizal cylinders, where they are identical in appearance with the trabeculae in the osculum of the modern sponge *Chalina*, or *Aplysina*, (Plate XXIII, Figs. 1 and 5).

I am inclined to consider these structures trabeculae of the astrorhizal canals. In some instances they are bars crossing a canal. This may be the case in the delicate lines crossing the pseudo-tubes, (really downward projections of the astrorhizal system), in *Stromatopora typica*. Very frequently they are ridges projecting into the lumen of an astrorhizal canal or

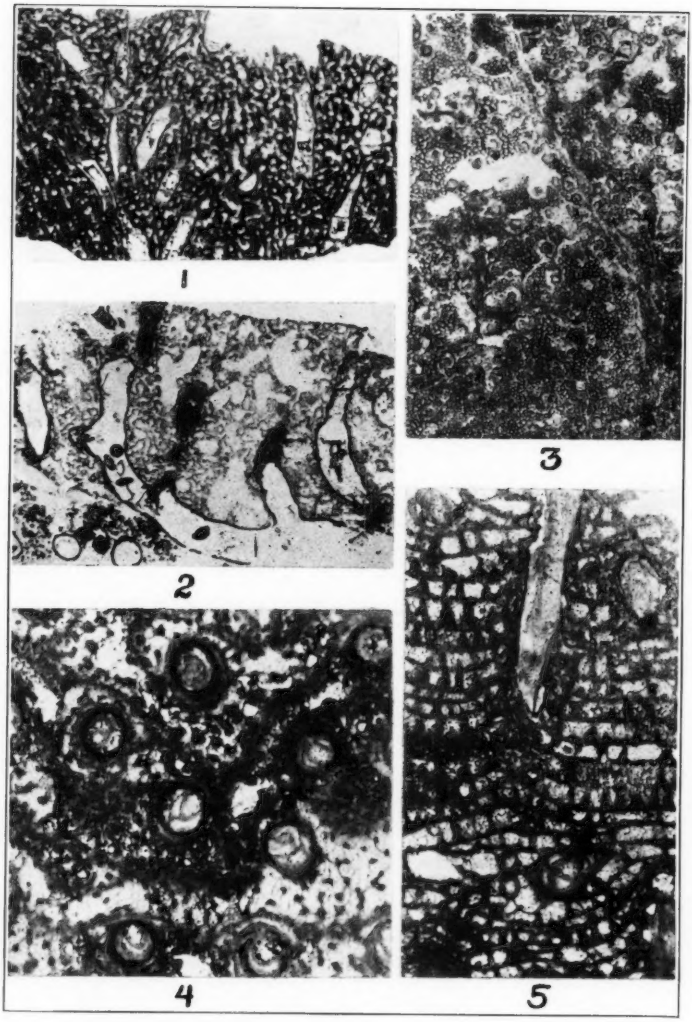

Plate XVIII

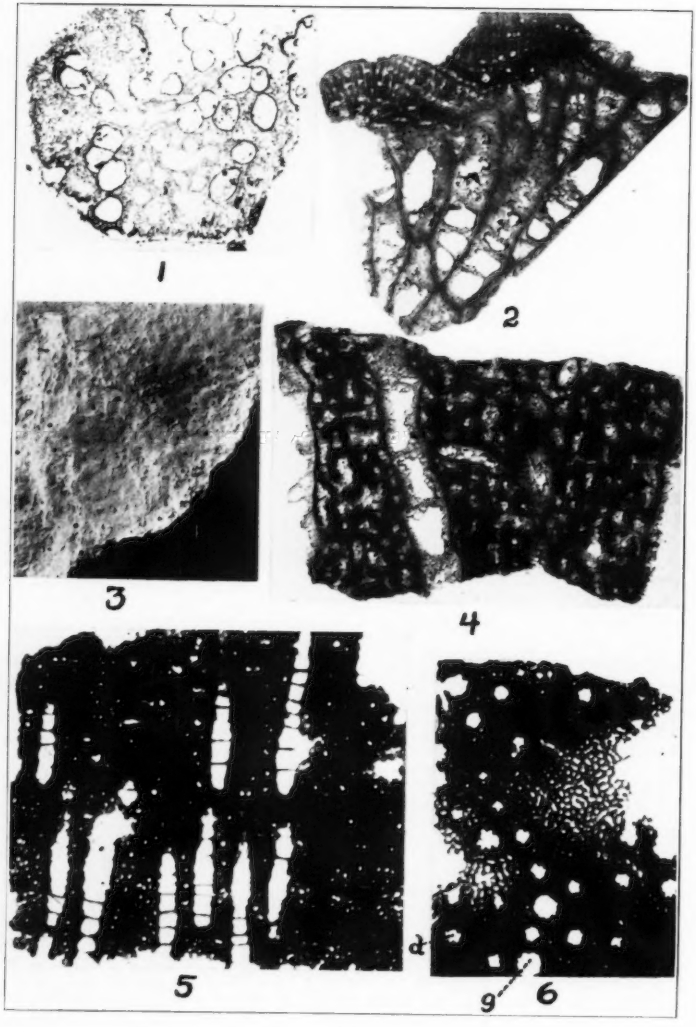

Plate XIX

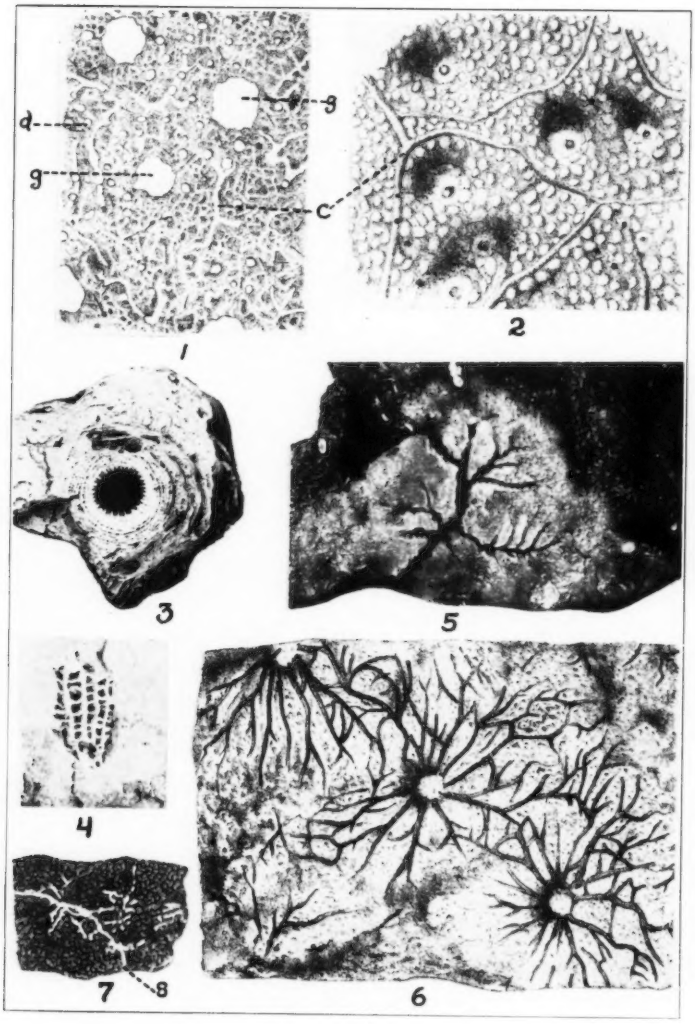

Plate XX

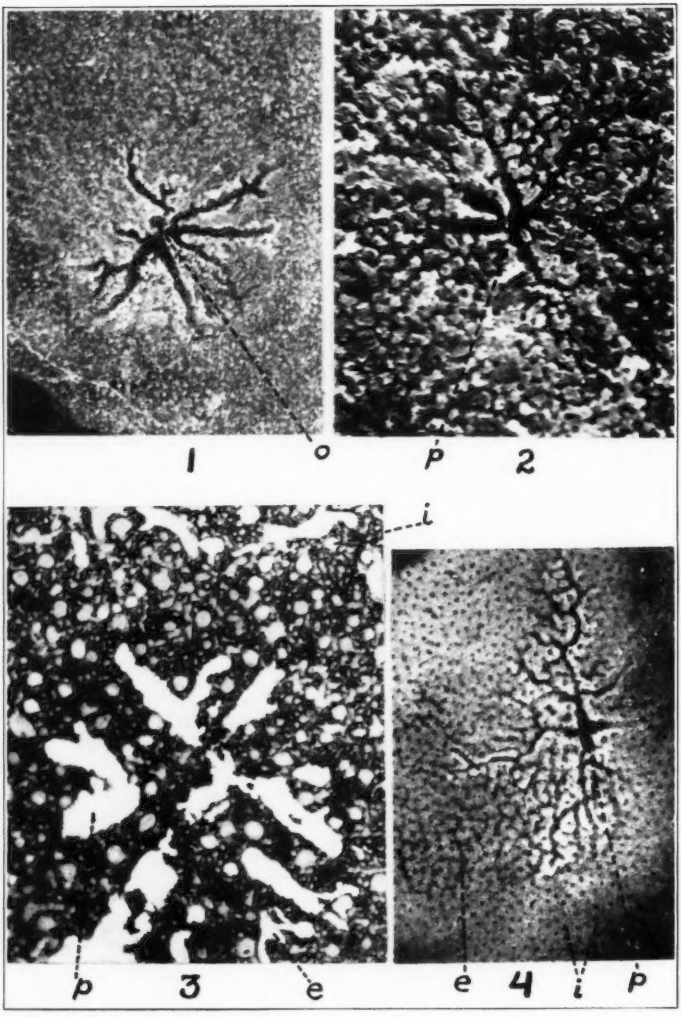

Plate XXI

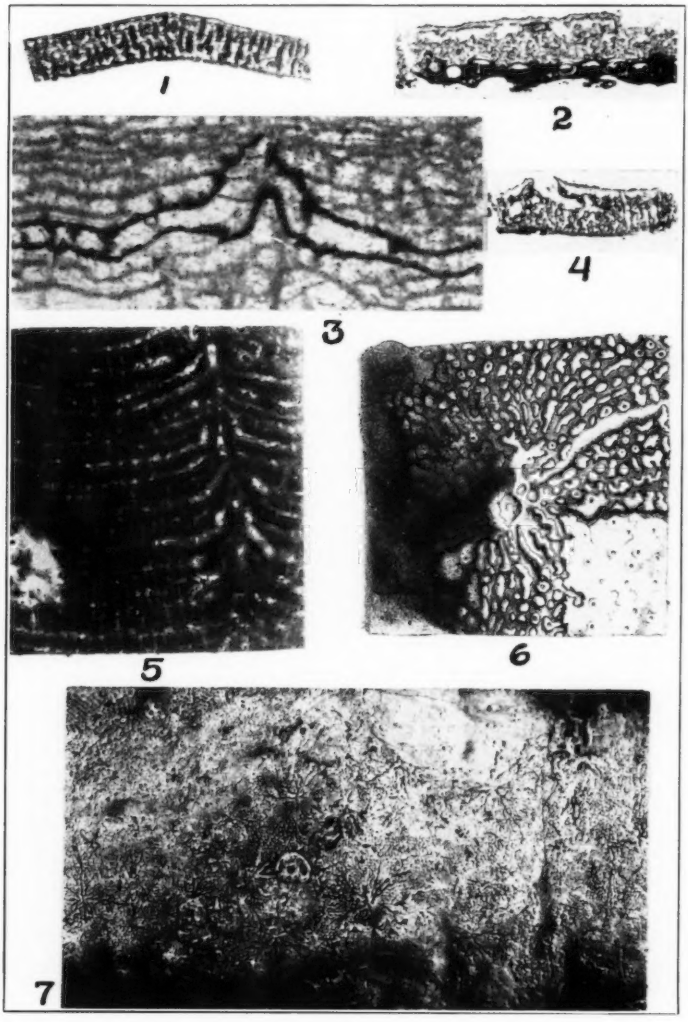

Plate XXII

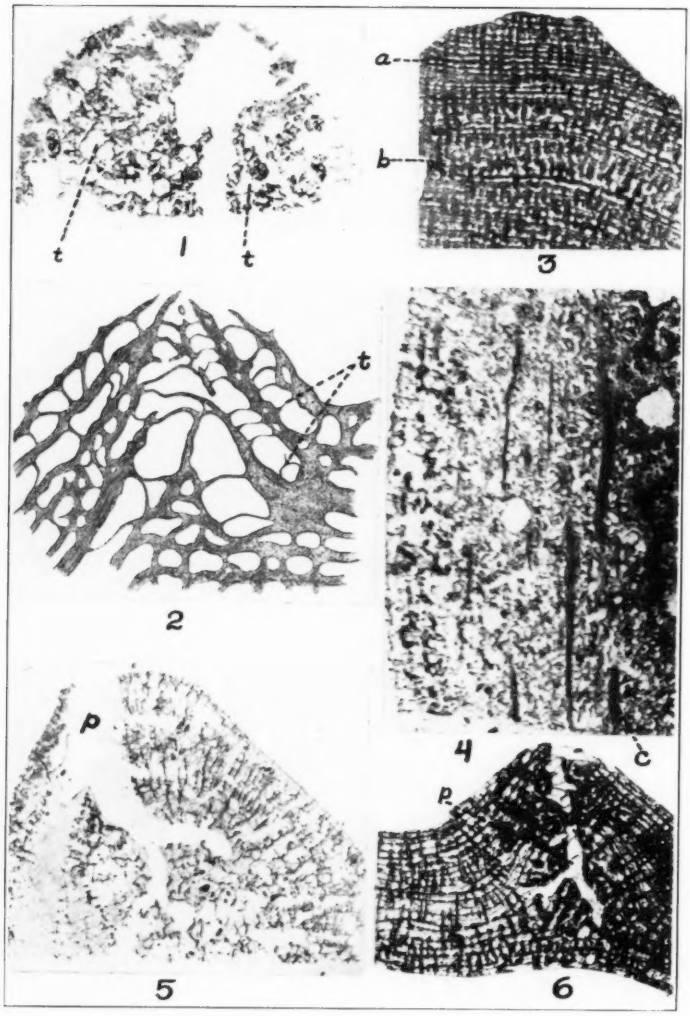

Plate XXIII

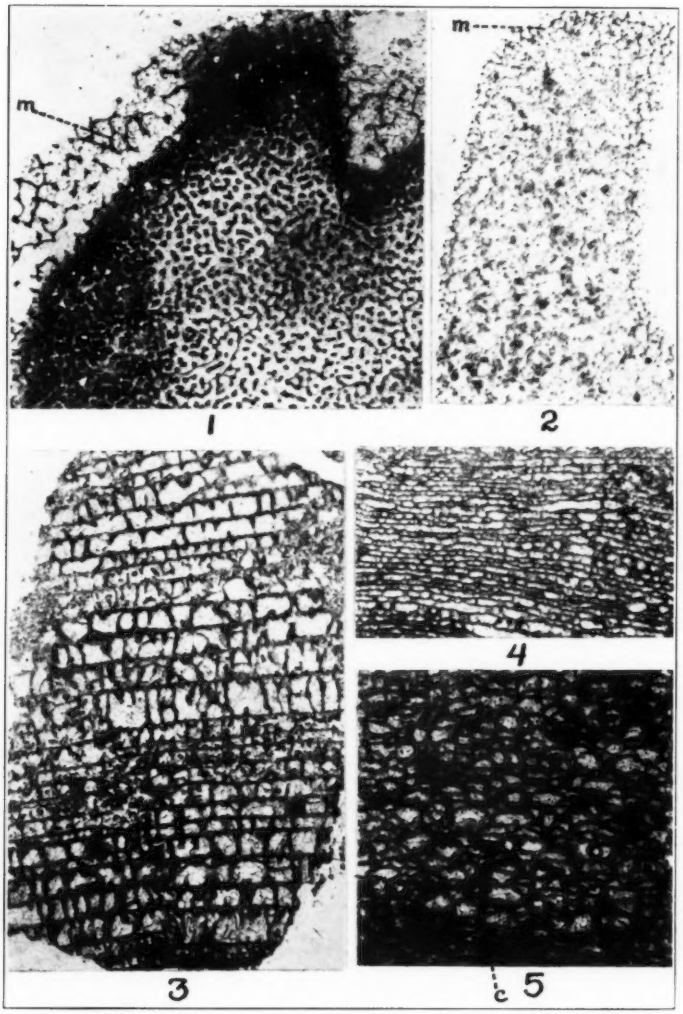

Plate XXIV

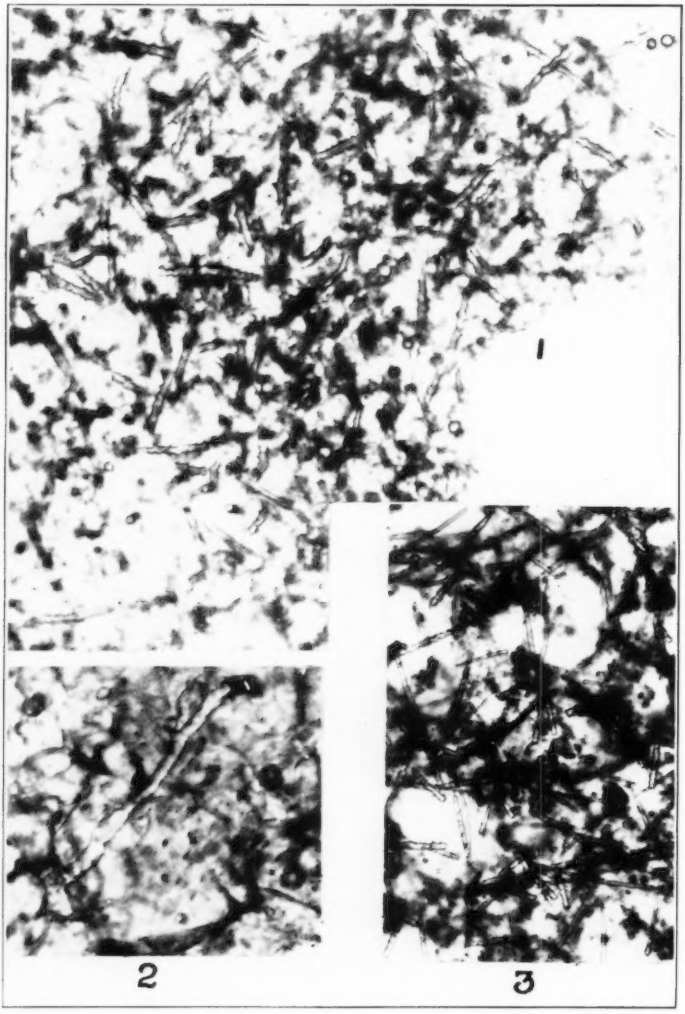

Plate XXV

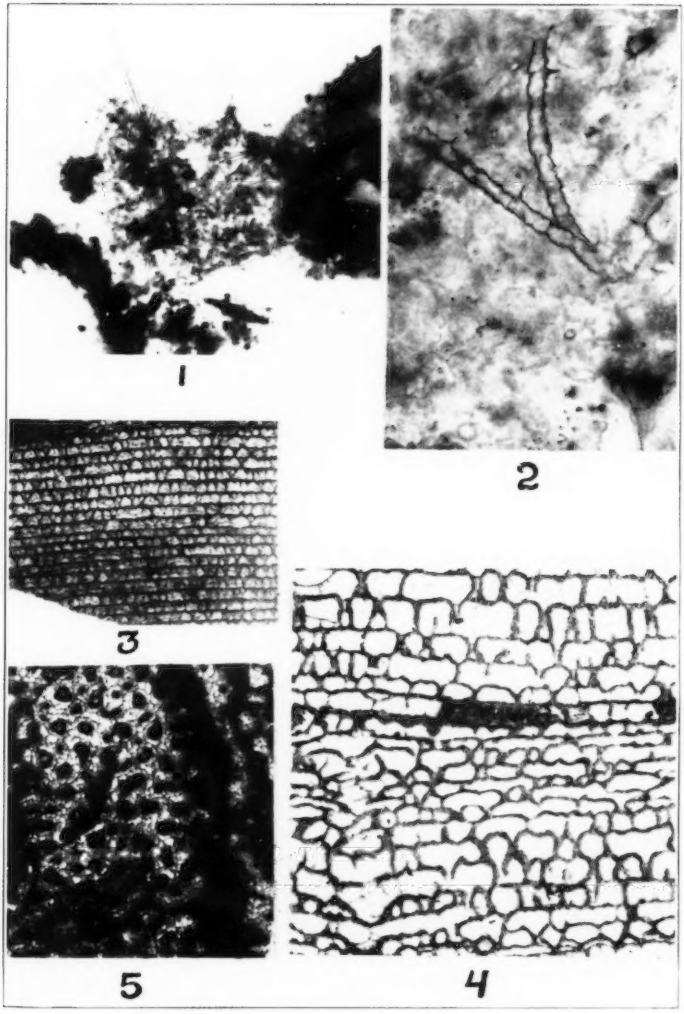

Plate XXVI

cylinder. Here they may be arranged longitudinally, or cross at any angle.

X.—PILLARS AND LAMINAE

Stromatoporoids have been described in terms of pillars and laminae; while usage has made these terms almost indispensable they will not stand critical examination.

In *Clathrodictyon striatellum* and *C. cellulosum* a hollow cone inflected from the lower layer of the lamina into an interlaminar space makes a pillar, evidently, by folding. As a rule this hollow cone does not reach the next lower lamina; but when it does it forms a tube wider at the top than at the bottom—a truncated hollow cone. In some species of *Actinostroma* the pillars are hollow and of uniform diameter throughout. They probably were formed after the manner described above. The Sandhegers thought that these hollow columns housed bryozoan zoöids.

The pillars may be exactly what their name implies or they may hang like stalactites from a lamina into an interlaminar space, in either case being produced by folding. (Plate XXVI, Figs. 3 and 4.)

Nicholson in describing *Stromatopora* says that the laminae are poorly developed and that the growth is by latilaminae, (see Plate XXII, Fig. 1), really thick lamellae. The pillars of *Stromatopora* have a very irregular arrangement often not extending completely through the lamella, and often sending off branches that may join neighboring pillars; these off-shoots Nicholson considered poorly developed laminae. The whole arrangement suggests complicated folding.

The branches of pillars that bend over and become horizontal bars in *Stromatopora* become the essential elements in *Stromatoporella*. Pillars are still in evidence but the horizontal bars have become so prominent that they suggest the laminae of other genera; these bars, however, are discontinuous, frequently bending down to form pillars extending to the next lower bar. They are part of the general folding and not limits of periodic growth.

Stromatopora and especially *Stromatoporella* suggest, by

their structure, that some laminae might also have been produced by folding for it would be but a step from the pseudolaminae of *Stromatoporella* to the true laminae of other genera.

In *Stromatoporella* there is apparently no periodicity of growth; the units are all spread out in one plane very commonly encrusting some other organism. This encrustation may be very thin—as thin as the film formed by some of the more delicate fresh water sponges.

Stromatoporella very closely resembles in structure certain non-laminate fresh water sponges, that is, sponges that have no habit of periodic growth, (Plate XXII, Fig. 7).

The complicated arrangement of pillars and laminae in *Clathrodictyon vesiculosum*, where the laminae are so crumpled that they can hardly be distinguished from pillars and where laminae in themselves are never limits of periodic growth, suggests very strongly that pillars and many laminae may have had the same origin. Distinct laminae, and especially double laminae, may be the remains of dermal layers.

We must not look to folding to account for all of the architecture of a stromatoporoid. Off-shoots from laminae and pillars occur in some stromatoporoids; the spokes in the hub and spoke arrangement of the laminae of *Actinostroma* are probably off-shoots from the pillars and in no way due to folding. True and double laminae limiting periods of growth also occur in this genus.

Stromatoporoids are usually described as having a reticulated structure, in reference to the arrangement of pillars and laminae. This is most distinct in *Actinostroma*. *Millepora* sections do give a reticulated appearance but here the picture is produced not by cut pillars and laminae but by the cut walls of the coenosarcal tubes.

This term, reticulated, has also been used in describing the ultimate structure of pillars and laminae. It takes a strong imagination to find any reticulation here.

The texture of a stromatoporoid consists of minute indefinitely shaped granules, that may be arranged in lines, and at times two series of lines crossing at right angles. It is

usually only in the vertical lines that the granules are arranged to form anything like fibres.

In *Stromatopora* and *Stromatoporella* the pillars are porous and often pierced by what seem to be small tubes. Heinrich uses this as a basis for his classification. It seems to be assuming too much to say that the small tubes communicated with ciliated chambers but according to the hypothesis here present this would be the location of the ciliated chambers. It may be simply that the structure is coarser and more distinct in these genera than in the more delicate forms, or in a more complete form of preservation.

The granular structure gives to the sections a hazy appearance—pillars and laminae shading off without a sharp boundary such as we see at the edge of a cut wall or septum of a coral or indeed of the coenosarcal tubes of *Millepora*. Mineralization may destroy the hazy granular appearance but occasionally a crystal of calcite will be seen still including the granular remains of the original organic material of the stromatoporoid.

It seems to me that this rather strengthens von Rosen's idea that the stromatoporoids were horny sponges that had become calcified.[3] It will be seen, however, that they were probably siliceous sponges.

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[3] Friedrich Baron Rosen, über die Natur der Stromatoporen und über die Erhaltung der Hornfaser der Spongien im fossilen Zustande. Verhandlungen der Russich-Kaiserlichen Mineralogischen Gesellschaft. 2nd ser., vol. 4, pp. 1 - 98, 1869.

Nicholson speaks in the highest terms of von Rosen's work but does not accept his conclusions. Since the publication of Nicholson's monograph little attention has been paid to the really remarkable studies of von Rosen. Text books have mentioned that he considered the stromatoporoids sponges but we read nothing of the careful investigations of the conditions of fossilization, the well prepared sections and the comparisons he made between stromatoporoids and other fossil sponges.

Von Rosen speaks of errors of interpretation that had been made in the past due to scant knowledge ("mangelhaften Kenntniss") of living sponges but notes that progress was being made in this branch of zoology. Haeckel's "Die Kalkschwämme" appeared in 1872. This study was just what was needed to round out von Rosen's work, but unfortunately it appeared three years too late for his use.

XI.—CONTRACTION

Most sponges are remarkably contractile. Under changes of environment the pores or even the paragastic cavity may become entirely obliterated. The changes produced by contraction are so great among living sponges that in the past different generic names have been given to contracted and uncontracted states of the same species. A contracted *Sycon* looks like a larval sponge. Sollas, (Challenger Report), gives special names to special forms of contraction. During contraction spicules and organic matter are rolled up into what we may call adventitious columns, (Plate XXIII, Fig. 4). It would be indeed strange if fossil sponges should always be found in the expanded state. One would naturally expect to find a large proportion contracted.

Parks, (Silurian Stromatoporoids, Univ. Toronto Study Ser., No. 6, p. 6, 1909), has shown the great similarity, if not identity, of the fibres of *Actinostroma tenuissimum* and *Stromatopora typica*. He also describes a specimen of *S. constellata* "with a fine grained stromatoporoid having the typical structure of an *Actinostroma*" growing beneath it.

This is not a very unusual condition and since the intimate association of the various elements suggests that we are dealing with but one specific growth, it can, I believe be best explained on the assumption that the *Stromatopora* portion is an

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Von Rosen's conclusions can be best summed up in his own words.

"My researches have taught me that the stromatoporoids are true horny sponges differing, however, from all other sponges of the present and past by an unlimited sequence of thin lamellae, each of which actually represents an individual sponge; the stromatoporoids are, therefore in the full sense of the word, compound, (zusammengesetzte) sponges."

It appears from this that von Rosen did not know that sponges with a lamellar habit of growth occurred in the fresh waters.

Von Rosen considered each lamella, rather than each astrorhizal system, a unit of a compound sponge. Limiting units to astrorhizal systems is more in accord with modern ideas of sponge anatomy.

The discovery of remains of spicules removes the stromatoporoids from the order of horny sponges (*Ceratospongiae*) but not from the class *Demospongia*.

expanded, and the *Actinostroma* portion a contracted, state of the same organism.

A stronger suggestion of contraction than in the combination of two genera just mentioned is found in many stromatoporoids that present large pillars, or better, columns that cannot be explained as directly the result of the folding of the choanosome of a simple rhagon. These columns may extend without breaks entirely through the colony. They are massive or fibrous, never porous nor do they have the minute canals at times seen in true pillars. Pillars and columns may occur side by side or one portion of a colony may be supplied with columns while another has only pillars. All of this gives the impression that the columns are adventitious structures and that they occur only under certain conditions, in short that they are analogous to the contraction columns found in sponges. Isolated columns occur in *Stromatopora* and *Actinostroma*. In *A. bifarium* they make up an essential element of the species; in *Clathrodictyon* the columns, when they occur, are usually indistinct; the genus *Actinodityon* Parks, (Silurian Stromatoporoids, Univ. Toronto Studies No. 6, p. 30, 1909), may be a *Clathrodictyon* with such columns, according to Parks "they pass through the tissue of what is otherwise an ordinary *Clathrodictyon*."

Nicholson rather hesitatingly founded the genus *Syringostroma* on the constant presence of the large "pillars" and gave it the name *Syringostroma* because of the astrorhizal canals shown cut across in vertical sections. They are arranged in parallel rows like the stops of a shepherd's pipe, hence the name. In Nicholson's illustration, (Geol. Surv. Ohio, vol. 2, Pt. 2, Pl. 24, Figs. 2-2b, 1875), this is well shown.

There has been great uncertainty among authors as to what should be included in the genus *Syringostroma*. Parks and even Nicholson apparently consider the two genera *Syringostroma* and *Actinostroma* closely related. *Syringostroma* columns occur in *Actinostroma* and in some species all the pillars except for size, are identical in structure with *Syringostroma* columns.

Syringostroma has been considered a subgenus of *Stroma-*

topora. In the latter genus a latilamina is actually a lamella. often of considerable tickness; but in a section including a number of lamellae some will be found thin, without broken *Stromatopora* pillars, and with the *Syringostroma*-like arrangement of cut astrorhizal tubes associated with columns, (Plate XXIII, Fig. 3). If the whole mass is made up of these layers we call it *Syringostroma;* if not, *Stromatopora.* I am inclined to think that *Syringostroma* is a contracted condition of *Stromatopora* or some other genus; that *Syringostroma* is a paleontological rather than a biological genus.

Extreme forms of contraction are occasionally to be found in stromatoporoids, contractions obliterating canals and paragastric cavities like the contraction that occurs in *Sycon;* but while the canals are gone the micro-structure still persists and one is forced to believe that our fossil is a stromatoporoid.

XII.—STROMATOPOROIDS AS LIMESTONE BUILDERS

Stromatoporoids have long been considered limestone builders of an importance equal to that of the true corals; and naturally it was assumed that, like the corals, they secreted a calcareous skeleton in life. Organisms form their skeleton and shells from the salts in solution in the waters in which they live, but dead organism may also be limestone builders to no mean extent.

Twenhofel, (Treatise on Sedimentation, p. 242, 1926), in discussing the precipitation of calcium carbonate by decaying matter says: "most limestones are composed of fossils only in part and that usually the minor part. The remaining portion consists of finely divided calcite in which are few traces of organic matter. It appears probable that this finely divided calcium carbonate was at least partly produced by precipitation through inorganic agencies or through reaction with ammonium carbonate resulting from organic activity or the decay of organic matter." Possibly a horny sponge in decaying might help in its own calcification by developing ammonium carbonate.

It is possible that stromatoporoids need not to have been lime secreting organisms for all that they even help build up

reefs. In the Upper Jura of Swabia, according to Grabau, (Principles of Statigraphy, p. 442), occur reefs "built largely of lime-secreting sponges." Grahau states that "the genus *Cnemidiastrum* predominates," *but Cnemidiastrum belongs to the Silicispongiae.* Here we have large limestone reefs built by organisms that did not secrete lime.

XIII.—SPICULES

The spicules of undoubted Silurian and Ordivician siliceous sponges are frequently calcareous, (crystalline calcite), and it is not uncommon to find siliceous sponges with no more suggestion of the presence of spicules than we find in most stromataoporoids. "The evidence indicates that many of the spicules go into solution not long after the death of their builders," (Twenhofel, Treatise on Sedimentation, p. 373).

In the Pliocene of Florida, (West Palm Beach drainage canal), modern sponges occur, fairly well preserved, with no traces of spicules, or with spicules in which the silica has been replaced by calcium carbonate.

Spicules are not necessary in relating an organism to the *Porifera.* Organisms other than sponges, i. e., the coelenterate, *Alcyonium,* contain spicules. In this discussion, in seeking an analogy stress has been laid on the anatomy of the fossil. A biologist working with living material would consider the anatomy of as great, if not of greater importance than the presence or absence of spicules; but a paleontologist who has to work with much poorer material feels the need of the distinctive spicules to correlate a fossil with the sponges, and frequently he wants big ones.

Spicules are often quite small. The dermal spicules of *Ephydatia everetti,* (a fresh water sponge), are 0.00063 inches long. It is not an easy task to find such minute structures in sections of fossils often poorly preserved. And it must be remembered that no other fossils have received so little study and that many sections would have to be made to find traces of even larger spicules that could easily be lost or altered in solution.

Spicules in modern sponges are frequently arranged in a

very characteristic meshwork, (Pl. XXIV, Fig. 2), such a meshwork, for all that individual spicules can hardly be recognized, is also to be seen in such Trenton sponges as *Zittelella lobata,* (Geol. Surv. Ill., vol. VIII, Pl. 4).

The skeleton of a stromatoporoid is a meshwork but it is usually a meshwork of comparatively heavy and indistinct elements not suggesting spicules. This is not always the case; isolated spots are occasionally found in sections where the typical stromatoporoid structure is replaced by a meshwork as distinctly sponge-like as that in the Trenton sponges just mentioned, (Pl. XXIV, Fig. 1).

In many sponges spicules are scattered, especially at the surface, in what seems a haphazard manner. This is the case in *Trochospongilla horrida,* (Pl. XXV, Fig. 3).

It has been my fortune to find in sections of *Stromatopora centrotum* (Girty) great numbers of calcareous tubes arranged in this haphazard way. All are more or less broken so it is impossible to determine the size accurately, but they are probably a trifle smaller than the broken spicules in a section of *Trochospongilla horrida* prepared for comparison.

(Spicules of fresh water sponges are often hollow and in section give the appearance of tubes. Spicules *isolated* from a sponge are apt to be flawless and so do not present the proper conditions for comparison with the broken spicules of a section. Spicules of Trochospongilla horrida are .005 inches long.)

The tubes are studded with spines similar to the spines on the spicules of *T. horrida.* Many of the spines are broken, leaving a boss or simply an irregularity in the course of the tube. They may have been as closely set as the spines on a *T. horrida* spicule (Plate XXV, Figs. 1-2; Plate XXVI, Fig. 2).

The peculiar bodies that I am inclined to look upon as spicules, though rarely found in numbers as in the specimen of *S. centrotum* just considered, do occur in many other stromatoporoids; they are usually isolated and far between as might be expected. "The evidence indicates that many of the spicules go into solution not long after the death of their builders."

XIV.—CONCLUSION

Accepting the "true stromatoporoids" as sponges complicates rather than simplifies stromatoporoid study. Spicules in the classification of sponges are often as important as teeth are in that of mammals.

Since it seems unlikely that spicules good enough for classification will be found, the architecture of the fossil must supply the basis for description. Heretofore, descriptions and measurements of laminae and pillars, with incidental mention of astrorhizae has been considered enough, though how it could suffice, even for *Hydrocorallines*, is hard to understand.

Fossils in other branches of paleontology are being described from a biological standpoint, while the stromatoporoids receive the description of curios made scientific by technical terms . It was this lack of any biological basis for the accepted descriptions of stromatoporoids that led me to seek for some logical explanation of the conditions found in them.

The accepted hypothesis seemed to offer no help so I sought elsewhere. By a strange freak of fancy my mind went back to earlier studies of the fresh water sponges to find the "faint analogy" which would serve in the study of stromatoporoids. This analogy consisted of the fact that both stromatoporoids and fresh water sponges often present similar and distinct suggestions of a primitive sponge type, the rhagon.

Since Haeckel, we have been accustomed to look upon the Calcareous sponges as the beginning from which the Porifera developed; but a simple rhagon is really as primitive in structure as is an Ascon.

It is very suggestive, and may mean much to the student of evolution, to find in the structure of the Silurian stromatoporoids a close approach to a theoretical ideal of the primitive sponge, and then to find the same in what Darwin called "the wonderful living fossils of the fresh waters."

The fresh waters are especially adapted to preserve with little change many early forms of life; the idea that bryozoans, sponges and many other forms of fresh water life are recent accessions, is without foundation. Tribolites still survive in

the fresh water *Apus; Estheria,* now a fresh water crustacean, goes back to the Cambrian.

The faint analogy, born of the fresh water sponges, received strength as my studies included marine forms. All of the sponges studied, that exhibited analogies often very striking, belonged to the *Demospongiae.* These analogies have led to the conclusion that the true stromatoporoids were the ancestors of the *Demospongiae.*

XV.—SUMMARY

The "tabulated tubes" of Nicholson have no existence; consequently stromatoporoids cannot be divided into milleporoid and hydractinoid groups.

All true stromatoporoids are built on one general plan.

Stromatoporoids, like sponges, consist of a number of biological units intimately connected with each other. The simplest form, (*Stromatoporella*), consists of one layer of units. In most stromatoporoids periodic growth, like that in the sponge *Trochospongilla leidyi,* builds up many layers or lamellae; but the intimate connection between units still persists.

A unit is made up of an astrorhizal system. The astrorhizae are homologous with the astrorhizae of sponges.

The center of an astrorhizal system, as in the fresh water sponge *Spongilla fragilis,* is in structure a close approach to the ideal of a simple rhagon. Deviations from the simple rhagon type occur in some stromatoporoids; these deviations are like those that occur in sponges.

Contractions occurred in stromatoporoids changing the structure, as do the contractions that occur in sponges.

Spicules, though rare, exist.

The true stromatoporoids were the ancestors of the modern *Demospongiae, and themselves were sponges.*

PLATE XVIII

FIGURE PAGE

1. Caunopore tubes in *Stromatopora*---------- 276
   Branching tube at left probably an alga; section does not show the stem from which the branches arise. Simple tubes at right are probably zoophytes. x 5.
2. Caunopore tubes in *Carterius*, (a fresh water sponge). The tubes are *Plumatella princeps*, (a fresh water bryozoan). Vertical section. x 10.
3. Surface of an undescribed species of *Clathrodictyon* with typical caunopore tubes. x 2.
4. Horizontal section of same. x 10.
5. Vertical section of same. x 10.

PLATE XIX

1. Horizontal section of *Carterius*, (a fresh water sponge), with caunopore tubes of *Plumatella princeps*, (a fresh water bryozoan.) x 10.
2. Stromatoporoid growing on *Favosites*. x 5.
3. Surface of *Stromatopora* with openings of caunopore tubes made up of a variety of organisms. x 1.
4. Caunopore tube of a tabulated coral resembling a zooidal tube of *Millepora*. x 10.
5. Vertical section of *Millepora*. Tabulated zooidal tubes resemble the caunopore tube in Fig. 4. x 10.
6. Horizontal section of Millepora D, dactylopores G, gastropores. x 10.

PLATE XX

1. Horizontal section of *Millepora* (after Nicholson). d, Dactylopores g, Gastropores c, Coenosarcal tubes, Nicholson's analogues of astrorhizae. x 24.
2. Surface of *Hydractinia circumvestieus* (after Nicholson). c, Coenasarcal tubes, Nicholson's analogue of astrorhizae. x 24.
3. Coral encompassed by stromatoporoid. x 1.
4. Coral encompassed by stromatoporoid. x 1.
5. *Spongilla fragilis* ---------- 283
   Astrorhizae of fresh water sponge found late in the season. Earlier in the season astrorhizae are more delicate. Compare with Fig. 6 of this plate and Plate XXI, Fig. 1. x 1.
6. *Stromatopore'la eifeliensis*, (after Nicholson)---------- 282
   Surface showing astrorhizae. x 1.

FIGURE PAGE

7. A Niagaran stromatoporoid belonging to an undescribed genus ---- 283
S, Stolon leaving astrorhizal center to connect with astrorhizae at a lower level. x 2.

PLATE XXI

1. *Stromatopora monticulifera* ---- 283
Surface showing true astrorhizae surrounded by negative astrorhizae. o, osculum separated from astrorhizae by tabeculae. x 10.
2. *Stromatopora monticulifera* ---- 284
Fracture removing upper lamina or rhagon. The rhagon is differentiated into cavity and astrorhizal tubes. P, Paragastric cavity. x 10.
3. *Spongilla fragilis* ---- 283
Horizontal section showing P, astrorhizal tubes of paragastric cavity; e, excurrent tubes (continuations of astrorhizae); i, incurrent tubes. x 10.
4. *Stromatopora foveolatum* (Girty) ---- 284
Horizontal section P, Paragastric cavity; e, excurrent tubes; i, incurrent tubes. Compare with Fig. 3. x 10.

PLATE XXII

1. *Stromatopora densum* ---- 293
A lamella showing irregular broken pillars. Compare with pillars of *Spongilla fragilis* Fig. 4. x 4.
2. *Trochospongilla horrida* ---- 291
This shows a double dermal layer. x 5.
3. *Clathrodictyon*, (an undescribed species from the Niagaran) ---- 285
Vertical section showing a Rhagon. x 20.
4. *Spongilla fragilis* ---- 285
Compare differentiated rhagon with rhagon of Fig. 3. Vertical section. x 5.
5. *Stromatopora foveolatum* (Girty) ---- 283
Astrorhizal cylinder made up of superimposed units, (rhagons). Vertical section. x 10.
6. *Stromatoporella granulata* after Nicholson ---- 282
Perforated dermal layer shown at lower right hand corner, compare with vertical section of dermal layer of sponge shown in Fig 4. x 6.
7. *Stromatoporella*, an undescribed species from the Devonian of Northern Michigan ---- 294
An encrusting stromatoporoid of the thickness of a delicate encrusting fresh water sponge. x 2.

PLATE XXIII

FIGURE PAGE

1. *Aplysina flagelliformis,* (a Marine Sponge) 292
   t, trabeculae in excurrent tubes. Vertical section. x 5.
2. *Stromatoporella eifeliensis.* Diagramatic section after Nicholson 292
   Compare trabeculae, t, with those shown in Fig. 1.
3. *Stromatopora densum* (Nicholson) 298
   Two genera as now defined are in this one specimen: a, *Syringostroma* and b, *Stromatopora.* x 4.
4. *Chalina arbuscula,* (Marine Sponge) 296
   C, Contraction columns. Vertical section. x 10.
5. *Chalina arbuscula* 289
   Vertical section showing the Paragastric cavity, P. x 10.
6. *Actinostroma,* (an undescribed species) 289
   Vertical section showing the paragastric cavity, P. x 10.

PLATE XXIV

1. *Clathrodictyon* (an undescribed species) 300
   Tangential section showing a spicular mesh, M. x 10.
2. *Chalina arbuscula* 300
   Tangential section showing a spicular mesh, M. Compare with Fig. 1. x 10.
3. *Clathrodictyon* (an undescribed species) 289
   Vertical section showing laminae. x 10.
4. *Clathrodictyon variolare* 289
   Vertical section showing laminae. The long open spaces are due to astrorhizal tubes being cut longitudinally. x 10.
5. *Syringostroma cf. baretti* Girty 296
   This is probably a *Clathrodictyon* with contraction columns similar to *Actinodictyon.* Vertical section. x 10.

PLATE XXV

1—2. *Stromatopora centrotum* (Girty) 300

1. Horizontal section showing numerous spicules. x 150.
2. The same showing one spicule with just one, (unretouched), spine in focus. x 360.

3. *Trochospongilla horrida* 300
   Horizontal section showing the spicules of a fresh water sponge. Compare the spicules of this figure with those shown in Fig. 1. The spicules measure .005 inches in length. x 82.

PLATE XXVI

FIGURE — PAGE

1. Young fresh-water sponge, *Carterius* ---- 280
   This individual started growth between two tubes of *Plumatella princeps* and would have finally enveloped the entire colony of fresh-water bryozoans, if it had been left undisturbed. The bryozoan tubes would have become caunopore tubes in the sponge mass. x 82.
2. *Stromatopora centrotum* (Girty) ---- 300
   Two spicules with several spines in focus. x 360.
3. *Clathrodictyon striatellum* (D'Orb.) ---- 288
   A vertical section showing the pillars in the shape of hollow cones. x 10.

4—5. *Clathrodictyon cellulosum* (Nicholson) ---- 288

4. Vertical section showing the folding of the pillars. x 10.
5. Tangential section showing the hollow cones, (negative astrorhizae). x 10.

A LIST OF PLANTS GROWING UNDER CULTIVATION IN THE VICINITY OF COLD SPRING HARBOR, NEW YORK.

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I. INTRODUCTORY.

There are probably more species of introduced and cultivated plants on Long Island in proportion to its area than in most other parts of the country. One reason is that the district has been planted a longer time. Additional factors are the large amount of importing which has taken place in the past, and the extensive works in landscape architecture which have been executed there. The imported plants appear to have been brought principally from England, France, Holland, and Japan.

Long Island has been found particularly valuable in recording the effects of the climate and soil of other regions by affording an opportunity to observe the gradual failure of introduced species of trees and plants. [1] Thus a list of some of the plants in cultivation on Long Island at this time may be valuable in future years if only for the fact that it may indicate

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† The compilers are indebted to Professor O. E. Jennings of the Department of Botany, University of Pittsburgh, for criticism of the manuscript, and to the Library of Dartmouth College for many courtesies facilitating their work.

[1] A brief discussion by the senior author of the physical conditions affecting plant life on Long Island together with the more common cryptogams and phanerogams recorded as native from the region is found in the American Midland Naturalist Vol. IX, nos. 6, 7, 9, 10, 11, 1924-25, pp. 1-252. These lists also include a few species introduced on Long Island, but the great majority of those thus considered are native to the northeastern portion of North America.

those species which have survived or become naturalized, or in the words of the late Professor Sargent, "valuable for what is not there."

The plants whose presence we record should be regarded only as embodying a minority percentage of the species of plants which are under cultivation on Long Island at this time (1926), and of course can not include the many introduced species which are planted every year on the various estates. A very few of the plants we list are not found growing in the open but only in green houses, but the rest of the data should prove advantageous to some plant systematists as well as to students of landscape architecture, (*) who are interested for one reason or another in the various families of seed plants growing on Long Island at the present time. It also indicates the attractive opportunities which exist for the study of Hemerecology on Long Island, [2] while plant morphologists, physiologists, pathologists and cytologists will find conveniently at hand much material of a type not ordinarily obtainable in the vicin-

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* An elaborate system of public parks has been projected and partly executed on Long Island. For details see the Reports of the State Council of Parks, obtainable at 302 Broadway, New York. With such developments, the study of the cultivated plants of Long Island assumes increased importance.

[2] Harshberger, J. W. The Ecology of Cultivated Fields, Parks and Gardens. Ecology IV: 297-306. It is understood that Dr. Harshberger is making a study of the old cellar holes of Long Island, with especial regard to the cutivated plants persisting about them.

It seems of value to cite at this place three works containing references to the flora and old gardens of Long Island.

1818-19. Cobbett, William. A Year's Residence in the United States of America. Published in New York and London. Printed for the author by Clayton and Kingsland.

1833. Stuart, James. Three years in North America. See Vol. I for references to old gardens. Edinburgh. Cadell.

1909. Jameson, J. Franklin. Narratives of New Netherlands, 1609-69. Among "original" narratives of Early American History series. Scribners, 1909. On p. 298 are given lists of native plants, 1650. Medical plants to the number of 30-40 are enumerated, presumably intended to cover Long Island as much as any part of the province.

ity of a summer biological laboratory. The estates on which these plants were growing are well within a thirty mile radius of the Biological Laboratory, Cold Spring Harbor, New York. The following summary of our data [1] indicates in part the present richness in plant families of this particular region of Long Island.

	No. Living Families (Engler and Prantl)	No. Families represented in list of Cultivated Plants	No. Families represented in list of Native Plants	Total Number Families on Long Island	No. Genera Cultivated Plants in List	No. of Species Cultivated Plants in List
Pteridophyta	17	6	9	9	26	43
Gymnospermae	5	4	2	4	39	214
Monocotyledoneae	45	16	19	25	129	220
Dicotyledonae	243	110	96	123	513	1607
Totals	310	136	126	161	707	2084

It may be of interest to observe at this point that the following families listed as being present in the native flora of the region (1) are missing from this list of cultivated plants.

PTERIDOPHYTA: *Ophioglossaceae, Marsiliaceae. Equisetaceae, Isoetaceae. MONOCOTYLEDONEAE*: *Sparganiaceae, Zannichelliaceae, Zosteraceae, Scheuchzeriaceae, Vallisneriaceae, Lemnaceae, Xyridaceae, Eriocaulaceae, Pontederiaceae, Juncaceae, Melanthaceae, Smilaceae. DICOTYLEDONAE*: *Saururaceae, Cannabinaceae, Urticaceae, Santalaceae, Phytolaccaceae, Corrigiolaceae, Aizoaceae, Alsinaceae, Ceratophyllaceae, Callitrichaceae, Monotropaceae, Cuscutaceae, Lentibulariaceae, Orobanchaceae, Phrymaceae, Plantaginaceae, Ambrosiaceae.*

Families given only in this list, and not in the native flora of the region (1) are:

PTERIDOPHYTA: *Cyatheaceae* (?)

GYMNOSPERMAE: *Cycadaceae, Ginkgoaceae.*

MONOCOTYLEDONEAE: *Pandanaceae, Aponogetonaceae* (?), *Palmaceae, Musaceae, Cannaceae, Marantaceae, Garryaceae. DICOTYLEDONAE*: *Proteaceae, Nyctaginaceae, Basellaceae, Trochodendraceae, Lardizabalaceae, Ca'ycanthaceae, Resedaceae, Pittosporaceae, Tropaeolaceae, Meliaceae, Empetraceae, Coriariaceae, Dilleniaceae, Ternstroemiaceae, Tamaricaceae, Begoniaceae, Thymelaeaceae, Punicaceae, Myrtaceae, Diapensiaceae, Myrsinaceae, Sapotaceae, Loganiaceae, Gesneriaceae.*

II. ACKNOWLEDGEMENTS.

The basic data for this list was secured through the courtesy of the owners, superintendents, or other officials of the following estates:

1. Estate of Mr. Frank Bailey, Locust Valley—Mr. Frank Bailey. [3]
2. Country Life Press, Garden City—Mr. Leonard Barron, Editor. [4]
3. Home of C. B. Davenport, Cold Spring Harbor—Dr. and Mrs. C. B. Davenport.
4. Estate of Mr. Henry DeForest, Cold Spring Harbor—Mr. J. G. Melrose.
5. Estate of Mr. Childs Frick, Clayton—Mr. Childs Frick.[5]
6. Estate of T. A. Havemeyer, Locust Valley—Mr. Albert LaHodney.
7. Hicks Nurseries, Westbury—Mr. Henry Hicks. [6]
8. Estate of A. G. Hodenpyl, Locust Valley—Mr. Edward Wood. [7]

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[3] The Bailey estate is well known for its collection of Delphiniums.

[4] The Evergreen Garden, (Country Life Press, Garden City, N. Y., 1920) P. 1-8. The pamphlet contains an incomplete list of the plants under cultivation at the Country Life Press. Typewritten lists furnished the compilers by Mr. Barron were additional sources of records from this locality.

[5] Childs Frick, "Pinetum Claytonense—A List of the Varieties of Coniferous Plants Growing at Clayton, N. Y." Privately printed, 1924. Pp. 1-27. This collection was started in the spring of 1919 and now comprises some twenty-six genera and some one hundred and ninety species. Few specimens have reached the height of twenty feet. Many of the rare varieties are represented only by seedlings.

[6] The Hicks Nurseries feature acid soil plants.

[7] The compilers desire to express their appreciation of courtesies extended by Mr. Hodenpyl in connection with the preparation of this list. Of interest to students of the cultivated plants of Long Island is

9. Estate of Mr. Otto Kahn, Cold Spring Harbor—Mr. John A. Forbes.

10. Estate of W. J. Matheson, Lloyd Neck, Huntington—Mr. James Kirby.

11. Estate of Mr. G. D. Pratt and "Dana Island," Glen Cove—Mr. J. T. Johnson. [8]

12. Estate of Mr. Louis C. Tiffany, Laurelton—Mr. Stanley Lathrop.

13. Estate of J. N. Willys, Center Island—Mr. William MacKay.

Mr. Hodenpyl's card index of the plants growing upon his estate. The home of Mr. Hodenpyl is known as Hill House, and is located on the Piping Rock Road, Locust Valley, Long Island. The home is Elizabethan in architecture, brick and half timber, and the grounds cover 120 acres. About one-half is covered with beech, birch, hickory maple, dogwood and white pine woods, with much planting of suitable shrubbery and native wild flowers. A large number of paths in the open are planted with many dogwoods, wild roses and species of *Berberis, Cercis, Cotoneasters, Viburnums, Malus,* etc.

Among the special groups of plants featured on this estate are a considerable planting of evergreens in a large group—Cedars, hemlocks, white pines, Scotch and Mugho pines, varieties of *Taxus,* Arbor Vitae, Heather, *Kalmia, Rhododendron, Andromeda, Leucothöe,* etc., and numerous evergreen ground covers. There is also a collection of *Berberis,* evergreen and deciduous—perhaps 25 varieties in one planting; a collection of Cotoneasters of twenty-nine varieties, two of each kind; a collection of *Cornus* ten or twelve varieties, including *Kousa,* (Japanese and Chinese) and Korean; a collection of *Viburnums;* a lilac garden of forty varieties; numerous and quite large plantings of Azaleas—sp. *Vaseyi, calendulaceum canadense, nudifora, japonica, Kaempfferi* with a few plants of other varieties; a planting of ten or twelve varieties of *Malus,* and many varieties of trees and shrubs in smaller numbers; in moist ground around springs and a small stream and pond—plants requiring moisture. There is also a collection of hybrid American wild asters. A soil acidity map of Mr. Hodenpyl's garden was made in 1923 by E. T. Wherry. (Ecology 4:395-401.) This is indicative of the opportunities for scientific research which exist in connection with the study of the cultivated plants of Long Island.

[8] This is the west one of the two small islands situated in the sound adjoining the Pratt estate.

III. A LIST OF PLANTS GROWING UNDER CULTIVATION IN THE VICINITY OF COLD SPRING HARBOR, NEW YORK.

The plants are catalogued following the general arrangement given in the Engler and Prantl "Syllabus der Pflanzenfamilien (1919), but where possible the nomenclature used has been that given in "Standardized Plant Names." [9] As this was not always found practicable a few species have been listed following the nomenclature of the Bailey "Standard Cyclopedia of Horticulture" and "Manual of Cultivated Plants."

It is important that those who find a use for this work realize its limitations from the start. The authors have not seen every species they have listed, but have combined the records of plants they identified themselves with those obtained through the cooperation already indicated. It is believed that these additional records are unusually reliable under the circumstances. Neither do we possess supporting specimens for any of the species listed for the reason that it would have been impossible, impracticable or discourteous to obtain them.

This work, however, is submitted in good faith, not with the idea that it renders unnecessary a more elaborate and annotated list, but as a trail maker for those more deeply concerned with the Systematic Botany of the region. Those

[9] Standardized Plant Names—a catalogue of approved scientific and common names of plants in American commerce. Published by the American Joint Committee of Horticultural Nomenclature, Harlan P. Kelsey, Secretary, Salem, Mass., 1923.

interested in the plants of this list from the standpoint of other fields of Botany will of course make sure of their identifications from such works as Bailey's "Manual of Cultivated Plants and "Cyclopedia of Horticulture" or other standard works. Undoubtedly errors will be found to occur in the

catalogue, and when so discovered, the reader will confer a favor by reporting them to us.

It will be noted also that a small number of the species listed from the estates are also native to Long Island. In most cases, however, they were transplanted to them, and undoubtedly receive the same care extended the introduced plants of the same type of environment where they are found growing. An additional consideration in listing them has been the convenience of the user of this list.

PHYLUM XI. EUMYCETES
CLASS III. BASIDIOMYCETES
ORDER I. HEMIBASIDIALES
AGARICACEAE

Agaricus campestris L. Common Mushroom, Pratt.

PHYLUM XIII. EMBRYOPHYTA ASIPHONOGAMA (ARCHEGONIATAE)
SUB-PHYLUM II. PTERIDOPHYTA
CLASS I. FILICALES
ORDER III. FILICALES LEPTOSPORANGIATAE
OSMUNDACEAE

Osmunda cinnamomea L. Cinnamon Fern. De Forest, Hodenpyl, Havemeyer.

Osmunda claytoniana L. Clayton's Fern. De Forest, Hodenpyl, Havemeyer.

Osmunda regalis L. Royal Fern. De Forest, Hodenpyl, Havemeyer.

CYATHEACEAE

Cibotium Schiedei Schlecht & Cham.. Mexican Cibotium, Pratt.

Dicksonia antarctica Labill. Hayemeyer.

POLYPODIACEAE

Adiantum cuneatum Langsd. & Fisch. Delta Maidenhair Fern. Tiffany. Var. *croweanum* Benedict. Crowe Maidenhair Fern. Tiffany.

Adiantum gracillimum Scheid. Mist Maidenhair Fern. Tiffany.
Adiantum pedatum L. American Maidenhair Fern. Kahn, DeForest, Hodenpyl, Bailey, Hicks.
Adiantum tenerum Sw. var. *Bausei* Hort. Bause Maidenhair Fern, Kahn. var. *Farleyense* Nichols, Havemeyer.
Alcicornium bifurcatum C. Chr. Staghorn Fern. Matheson.
Asplenium Belangeri Kunze. Havemeyer.
Asplenium platyneuron (L) Oakes. Ebony Spleenwort. Hicks.
Asplenium trichomanes (L) Maidenhair Spleenwort. De Forest, Country Life Press.
Athyrium Filix-femina Roth. Lady Fern. Woods, DeForest, Pratt.
Athyrium (*Asplenium*) *thelypteroides* Michx. Hodenpyl.
Camptosorus rhizophyllus (L.) Link. Walking Fern. De Forest.
Cystopteris bulbifera (L.) Bernh. Berry Bladder Fern. Hodenpyl.
Cystopteris fragilis (L.) Bernh. Brittle Fern. Hodenpyl.
Dennstaedtia (*Dicksonia*) *punctilobula* Moore. Hay Scented Fern. Hodenpyl, Country Life Press.
Cyrtomium falcatum Presl. House Hollyfern. Matheson, Tiffany.
Cyrtomium Fortunei J. S. M. Havemeyer.
Dryopteris Clintoniana D. C. Eaton. Clinton Foodfern. Hodenpyl.
Dryopteris cristata (L.) A. Gray. Hodenpyl.
Dryopteris dentata C. Chr. Downy Woodfern. Havemeyer.
Dryopteris filixmas Schott. Hodenpyl.
Dryopteris Goldiana (Hook) A. Gray. Hodenpyl.
Dryopteris hexagonoptera (Michx.) C. Chr. Winged Woodfern. Hodenpyl.
Dryopteris Linnaeana C. Chr. Oakfern. Hodenpyl.
Dryopteris marginalis (L.) A. Gray. Hodenpyl, DeForest.
Dryopteris noveboracensis (L.) A. Gray Hodenpyl, DeForest.
Dryopteris phegopteris (L.) C. Chr. Narrow Beechfern. Hodenpyl.
Dryopteris spinulosa (Muehl.) Kuntze. Hodenpyl. DeForest.
Matteucia Struthiopteris (L.) Tod. DeForest, Hodenpyl.

Nephrolepis exaltata bostoniensis Davenport. Boston Fern. Bailey.

Onoclea sensibilis (L.) Sensitive Fern. Hodenpyl.

Phyllitis Scolopendrium Newm. Harts-Tongue Fern. Pratt, Hodenpyl.

Polypodium aureum L. Golden Polypody. Tiffany.

Polypodium vulgare L. Common Polypody. Havemeyer, Tiffany, Pratt.

Polypodium Phymatodes L. East Indian Polypody. Havemeyer.

Polystichum acrostichoides (Michx.) Schott. Christmas Fern. DeForest, Hodenpyl, Hicks, Country Life Press.

Polystichum aculeatum Schott. Hodenpyl.

Polystichum braunii (Spenner) Fee. Hodenpyl.

Polystichum munitum Kaulf. Giant Hollyfern. Hodenpyl.

Pteris cretica L. Cretan Brake. Havemeyer.

Pteris multifida Poir. Spider Brake. Havemeyer.

Woodsia ilvensis (L.) R. Br. Rusty Woodsia. Country Life Press.

Woodsia obtusa (Spreng) Torr. Obtuse leaved Woodsia. Country Life Press.

Woodwardia areolata (L.) Moore. Chainfern. Hodenpyl.

Woodwardia virginica (L.) Sm. Virginia Chainfern. Hodenpyl.

SALVINIACEAE

Azolla caroliniana Willd. Tiffany.

Salvinia auriculata Aubl. Tiffany.

CLASS IV. LYCOPODIALES

ORDER II. LYCOPODIALES ELIGULATAE

LYCOPODIACEAE

Lycopodium complanatum. L. Ground Cedar. Hodenpyl.

Lycopodium obscurum L. Ground Pine. Hodenpyl.

ORDER II. LYCOPODIALES LIGULATAE

SELAGINELLACEAE

Selaginella apus Spring (*apoda* SPN) Basket Selaginella. Hodenpyl.

PHYLUM XIV. EMBRYOPHYTA SIPHONOGAMA (PHANEROGAMA)

CLASS AND SUB-DIVISION I. GYMNOSPERMAE

ORDER II. CYCADALES
CYCADACEAE

Cycas revoluta Thunb. Sago Cycas. Matheson.

ORDER IV. GINKGOALES
GINKGOACEAE

Ginko biloba L. Ginkgo. Bailey, Davenport, Willys, Matheson (male and female), DeForest, Hodenpyl, Hicks, Pratt, Havemeyer, Frick, Country Life Press; var. *Fastigiata* Hort. Frick.

ORDER V. CONIFERAE (CONIFERALES)[10]
TAXACEAE

Biota elegans Hort. Country Life Press.

Cephalotaxis drupacea Sieb. & Zucc. Japanese Plum. Bailey, Hodenpyl, Dana Island, Frick; var. *fastigiata* Pilger, Frick.

Cephalotaxus Fortunei Hook. Frick.

Podocarpus macrophylla Don. Yew Podocarpus. Dana Island. Havemeyer.

Taxus baccata L. (*Taxus brevifolia* SPN? Western Yew) English Yew. Matheson, Hicks, Bailey, Pratt, Havemeyer, Frick, Country Life Press. var. Dovestcn Yew (*Dovastoni* Laws) Bailey; Golden English Yew (*aurea* Carr.) Bailey, Frick; Golden Irish Yew (*fastigiata aurea*, Standish) Country Life Press, Frick, DeForest; Irish Yew (*fastigiata* Loud) Parsons, DeForest, Bailey, Frick; Spreading English Yew (*repandens*) Frick, Bailey, Kahn, Hodenpyl, Country Life Press. Variegated English Yew (*variegata* West) Bailey; Yellowberry Yew (*lutea* Endl.) Country Life Press, Bailey; *erecta* Loud; *Washingtoni*, Beiss, Frick and Country Life Press; *adpressa* Carr. Frick

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[10] The synonomy in this and certain other sections of the manuscript has been obtained through reference to "The Cultivated Evergreens." L. H. Bailey, The MacMillan Co., N. Y. City, N. Y., 1923.

Country Life Press; Short Leaf Yew (*aurea* SPN?), *erecta* Nicholls; *adpressa Dovastoni* SPN?, *Dovastoni variegata* Carr. *pendula* Hort, *ericoides* SPN. Frick.

Taxus canadensis Marsh. Canada Yew. Frick, Bailey, DeForest, Hodenpyl, Hicks, DeForest, Dana Island, Country Life Press, Havemeyer.

Taxus cuspidata Sieb. & Zucc. Japanese Yew. Frick, Bailey, Tiffany, Kahn, C. S. H. (Carnegie), DeForest, Hodenpyl, Hicks, Pratt, Havemeyer, Country Life Press; varieties *aurea* Hort. (*aurescens?*), *nana* Rehd., *densa* Rehd., *Hicksii* Rehd., DeForest, Bailey, Hicks, Country Life Press. "Korean" Frick. *aurescens* Rehd., Country Life Press.

Taxus "Wilsoni"? Chinese Yew. Frick.

Torreya californica Torr. California Nutmeg. Frick.

Torreya nucifera Sieb & Zucc. Hicks, Bailey, Havemeyer, Dana Island, Frick.

Torreya taxifolia Arn. Hicks.

PINACEAE

Abies amabilis Forb. Cascade Fir. Bailey.

Abies balsamea (L) Mill. Balsam Fir. Frick. Varieties: *Hudsonia* Engelm. Hudson Fir; *Hudsonia glauca* SPN, *Macrocarpa* Kent, Frick.

Abies cephalonica Loud. (*regina-ameliae* Loud.) Greek Fir. Pratt, Havemeyer, Frick. Country Life Press. Var. *apollinis* Link, Frick.

Abies cilicia Carr. Cilician Fir. Dana Island, Frick.

Abies concolor Lindl. & Gord. White Fir. Hodenpyl, Matheson, Bailey, Hicks, Pratt, Havemeyer, Frick, Country Life Press. Var. *lowiana*, A. Murr. Pacific White Fir, Hicks; Var. *argentea* Niemetz, *Wattezii* Beiss, Frick.

Abies Delavayi Franch. Delavay Fir, W. China. Frick.

Abies Fargesii Franch. Farges Fir. Frick, Country Life Press.

Abies Faxoniana Rehd. and Wils. Faxon Fir, W. China. Frick.

Abies firma Sieb. & Zucc. Momi Fir. Hicks, Frick. Var. *tschonoskiana* (SPN). Frick.

Abies Forrestii Craibb. Frick.

Abies Fraseri (Pursh) Poir. Fraser Fir or She Balsam. Frick, Bailey. Var. "*prostrata* SPN. Frick.

Abies grandis Lindl. Great Silver Fir. Bailey, Hicks, Frick.

Abies holophylla Maxim. Needle Fir. Hicks, Frick.

Abies homolepis Sieb. & Zucc. (*A. brachyphylla,* Maxim) Nikko Fir. Bailey, Pratt, Havemeyer, Frick, Country Life Press. Var: *umbellata,* Wils, Frick. Var. *Tomomi,* Rehd, Frick.

Abies koreana Wils. Korean Fir. Frick, Hodenpyl.

Abies lasiocarpa Nutt. Alpine Fir, Cork Fir. Hicks, Frick. Var: *arizonica* Lemm., Frick, Bailey, Hicks; *arizonica glauca* SPN, Frick.

Abies magnifica A. Murr. Red Fir. Frick.

Abies mariesii Mast. Maries Fir. Frick.

Abies montigena Hort. Country Life Press.

Abies nephrolepis Maxim (A Veitchii Lindl.) Frick, Hodenpyl. Var. *Chlorocarpa* SPN, Frick.

Abies nobilis Lindl. Var: *glauca* Beiss, Blue Noble Fir; *argentea,* Beiss (?). Frick.

Abies Nordmanniana Spach. Nordmann Fir. Pratt, Matheson, DeForest, Frick, Hodenpyl, Tiffany, Bailey, Hicks, Havemeyer. Var: *aurea spicata* Hort. Frick.

Abies numidica De Lanney. Algerian Fir. Frick.

Abies pectinata DC. (*alba,* Mill). Silver Fir. Frick, Bailey, Hicks, Havemeyer. Var: *pyramidalis* Voss, Matheson, Frick; *pendula,* Asch and Graebn, Frick.

Abies pindrow Spach. (*A. Webbiana* Lindl.) Pindrow Kashmir Fir. Frick.

Abies Pinsapo Boiss. Spanish Fir. Bailey, Hicks, Dana Island, Havemeyer, Frick. Var: *glauca* Beiss-Blue Spanish Fir, Frick, Hicks.

Abies recurvata Mast. Szechuen Fir. Frick, Country Life Press.

Abies sachalinensis Mast, Sakhalin Fir. Frick, Hodenpyl, Bailey. Var: *nemorensis,* Hort., Frick.

Abies sibirica Ledeb. (*pichta* Forbes.) Siberian Fir. Hicks, Frick.

Abies spectabilis SPN. (*Webbiana* Lindl.) N. W. Himalayan Fir. Frick.

Abies squamata Mast. Flaky Fir, W. China. Frick.

Abies Veitchi Murr. Veitch Fir. Frick, Bailey, Hicks, Dana Island, Havemeyer, Country Life Press. Var: *olivacea*, Shiras. Var: *"baluweiss"* (?), Frick.

Abies Wilsonii Hort. Frick, Hodenpyl.

Araucaria Bidwillii Hook. Bunya-bunya. Frick.

Araucaria excelsa. R. Br. Norfolk Island Pine. Havemeyer, Frick.

Araucaria imbricata Par. *A. araucana* Koch.) Monkey Puzzle. Frick.

Cedrus atlantica Manetti var. *glauca*, Manetti. Atlas Cedar. Pratt, Bailey, DeForest, Hodenpyl, Havemeyer, Frick, Country Life Press.

Cedrus Deodara Loud. Deodar Cedar. Havemeyer, Dana Island, Frick.

Cedrus Libani Loud. Cedar of Lebanon. Havemeyer, Dana Island, Pratt, DeForest, Frick. Vars: *brevifolia* Hook, *"aurea"* (*glauca* Carr?), *Sargentii pendula* SPN, Frick.

Chamaecyparis lawsoniana Parl. Lawson Cypress. Frick, Bailey, Hicks, Havemeyer, Dana Island; var: *glauca* Beiss, *Triomphe de Boskoop Cypress*, Bailey; var: *erecta glauca* Beiss, Blue Column cypress, Bailey; vars: *Veitchii glauca* SPN, *"Hollandi"* SPN, *argentea* Beiss, *filifera* SPN, *filifera glauca* SPN, *erecta viridis* SPN, Green Columnar Cypress, *alumi* SPN, Scarab cypress; *alumi glauca* SPN; *"albokessen"* SPN; *tamaricifolia* SPN; *Forsteckiana* SPN, Frick.

Chamaecyparis leptoclada Andely. Retinospora, Frick.

Chamaecyparis nootkatensis Sudw. Nootko Cypress, Bailey. Var: *glauca* Beiss. Blue Nootka Cypress, Bailey, Frick.

Chamaecyparis obtusa Sieb. & Zucc. Hinoki Cypress. Frick, Bailey, Hodenpyl, DeForest, Hicks. Var: *lycopodioides* Carr, Clubmoss Retinospora, *nana* Carr, Frick and Country Life Press; Dwarf Hinoki, *Filicoides* Beiss, Fernspray Retinospora, *pygmaea* Carr, Pygmy hinoki Cypress, Bailey,

Frick; vars: *aurea* Beiss, *gracilis* Nash, Frick and Country Life Press; *gracilis aurea* Beiss, Frick and Country Life Press, *aurea youngii* Nash; *crippsii*, Rend; *tetragona aurea* Nicholls; *lycopodioides* Korean SPN, Frick and Country Life Press; *filicoides* Korean SPN, Frick and Country Life Press; *ericoides* Boehmer (Sander's Retinospora), Frick; var: *nana pygmaea compacta* Hort.; var. *globosa*, Hort., Country Life Press; var. *Youngii*, Hort. (Young's Japanese Cypress, Country Life Press; *compacta* Hartw. and Ruempl., Country Life Press; *erecta* Beiss, Country Life Press.

Chamaecyparis pisifera Sieb. & Zucc. Sawara Cypress. Hodenpyl, Frick, Tiffany, Bailey, Hicks, Pratt. Vars: *aurea* Carr. (Golden Hinoki Cypress), Hodenpyl, Bailey, Willys, Frick, Tiffany, Country Life Press; *filifera* Beiss (Thread Retinospora), Hodenpyl, Bailey, Frick, Country Life Press; *squarrosa* Beiss and Hochst (Moss Retinospora), Hodenpyl, Bailey, Frick; *plumosa* Beiss (Plume Retinospora), Matheson, Frick, Country Life Press; *plumosa aurea* Japanese golden plumed Cypress, Country Life Estate; *filifera aurea* Beiss, Golden Japan cypress; *filifera aurea pendula* Drooping Japan Cypress, Country Life Press. Vars: *nana variegata* SPN; *filifera aurea* Beiss; *filifera aurea Fulleri* SPN; *Filifera nanae* SPN; *plumosa viridis* SPN; *plumosa argentea* Beiss; *plumosa aurea* Beiss; *plumosa cristata* SPN; *squarrosa minima* SPN; *squarrosa veitchii* SPN; *squarrosa Seiboldi* SPN; *squarrosa sulphurea* Beiss; *squarrosa dumosa* SPN (dwarf), Frick.

Chamaecyparis thyoides Britt. White Cedar. Frick, Dana Island. Tiffany, Bailey, Hicks. Var. *ericoides* Sudw. Cedar Retinospora. Bailey.

Cryptomeria japonica D. Donn. Common Cryptomeria. Bailey, Hodenpyl, Hicks, Havemeyer, Pratt, Country Life Press. Var. *dacrydioides* Carr. Frick; *cristata* Beiss, Frick; var. *Lobbi* Carr. Bailey, Frick; "*selaginoides*" SPN, Frick; var. *Lobbii* Hort., Country Life Press.

Cryptomeria Tomasuz Hort. Japanese Cedar. Country Life Press.

Cunninghamia lanceolata Hook. China Fir. Havemeyer, Frick.

Cupressus arizonica Greene. Arizona Cypress. Bailey, Frick. Var. *bonita* Lemm. Smooth Cypress. Frick.

Cupressus goveniana SPN (*Californica* Carr.) Gowen Cypress. Frick.

Cupressus lusitanica Mill. Portuguese Cypress. Frick. Vars. *Benthami* Carr. (Bentham Cypress) *Knightiana* Rehd. Knight Cypress, Frick. *glauca* Lam. Frick.

Cupressus Macnabiana Murr. MacNab Cypress. Frick.

Cupressus macrocarpa Hartw. Monterey Cypress. Havemeyer, Frick. Var. *lutea* Webster; Yellow MacNab Cypress, Frick. var. *variegata* SPN, Frick. var. *guadalupensis* Mast. Guadalupe Cypress, Frick.

Cupressus sempervirens L. Italian Cypress. Frick. Var. *horizontalis* Gord. Frick.

Cupressus torulosa Don. Bhutan Cypress. Frick.

Juniperus californica Carr. California Juniper. Frick.

Juniperus chinensis L. Chinese Juniper. Havemeyer, Bailey, Hicks, Frick, Country Life Press. Var. *pyramidalis* Carr. (Column Chinese Juniper.) Bailey, Hicks; var. *Pfitzeriana* Spaeth (Pfitzer Juniper), Bailey, Hodenpyl, Hicks, Frick, Pratt, DeForest, Country Life Press; var. *albovariegata* Veitch (Whiteleaf Chinese Juniper), Frick, Bailey; var. *foemina* Gord., Havemeyer, Frick; *aurea* Young, Frick; var. *japonica* Wilm. Japanese Juniper, Country Life Press; var. *erecta* Hort., Country Life Press. Var: *columnaris* SPN, *neaborensis* Beiss, *Fortunei* Beiss, *"Kaidsuko"* SPN, *Japonica* Vilm., *Japonica procumbens* SPN, *pendula* SPN, *Virginalis* SPN, *Virginalis aurea* SPN, *Virginalis variegata* SPN, *Virginalis variegata* SPN, *Virginalis globosa* SPN, *Virginalis globosa aurea* SPN, *Sargentii* Henry, Frick.

Juniperus conferta Parl. (*J. litoralis* Max.) Shore juniper. Country Life Press.

Juniperus communis L. Common Juniper. Bailey, Hicks, Eugenics Record Office Grounds C. S. H., Havemeyer, Frick;

var. *hibernica* Gord. (Irish Juniper), Hicks, Country Life Press; *montana* Ait. (Mountain Juniper), Hicks, Eugenics Record Office; *suecica* Loud. (Swedish Juniper), Bailey, Hicks, Frick; *depressa* Pursh (Prostrate Juniper), Hicks, Country Life Press, Frick; *aurea* Carr., Frick; *nana aurea* SPN; *fastigata* SPN; (Irish Juniper) *oblongapendula* Carr; *compacta* SPN; *montana* Ait. Frick; *Juniperus conferta* Parl. (Shore Juniper) Bailey, Hodenpyl, Hicks, Frick; *aureo-spica* Rehd. Country Life Press.

Juniperus excelsa Bieb. Greek Juniper. Havemeyer, Hodenpyl, Hicks; var. *stricta* Rollisson (Spiny Greek Juniper), Bailey, Hicks, Frick, Hodenpyl, Country Life Press.

Juniperus foetidissima Hort. Country Life Press.

Juniperus horizontalis Moench. Creeping Juniper. Frick, Havemeyer, Hicks, Bailey, Davenport; var. *Douglasii* Rehd. (Waukegan Juniper), Bailey, Hodenpyl; var. *glauca* SPN Blue Prostrate Savin. Country Life Press; *"Hills Russian"* SPN. Frick.

Juniperus Japonica Hort. Japanese Juniper. See *J. Chinensis* L.

Juniperus macrocarpa Sibth. Plumb Juniper. Frick.

Juniperus pachyphloea. Torr. Alligator Juniper. Bailey, Frick.

Juniperus phoenicea L. Phoenician Juniper. Frick.

Juniperus procera Hochst. African Juniper. Frick.

Juniperus procumbens Sieb. Frick. Var. *variegata* SPN, Frick.

Juniperus rigida Sieb. and Zucc. Needle Juniper. Bailey, Hicks, Frick. Country Life Press.

Juniperus sabina L. Savin. Pratt, DeForest, Frick, Hodenpyl, Hicks, Bailey, Havemeyer, Country Life Press; var. *tamariscifolia* Ait. (Tamarix Savin) Hodenpyl; *prostrata* SPN, Frick.

Juniperus scopulorum Sarg. Colorado Juniper. Hodenpyl, Bailey, Frick.

Juniperus squamata Lamb, Frick. Prostrate Juniper. Country Life Press; var. *Meyeri* Rehd. (Meyer Juniper), Bailey, Hicks, Havemeyer, Frick; var. *procumbens* SPN *Fargesii*

Rehd. and Wils. Frick and Country Life Press; *Wilsonii* Rehd. Frick, Country Life Press.

Juniperus tamariscaefolia Hort. Country Life Press. Var. *Argentea (glauca)* Carr., *elegantissima* Hochst; *Canaertii* Sengel. Frick. Var. *Schotti* Gord., *pyramidalis* Carr., *pyramidiformis* D. Hill, *viridis columnaris* SPN, *pendula* Carr., *tripartita* R. Smith; *plumosa* Rehd.; *reptans* Beiss, Frick.

Juniperus virginiana L. Red Cedar. Matheson, Bailey, Hicks, Havemeyer, Pratt, Frick, Country Life Press; var. *Kosteri* SPN (Koster Red Cedar), DeForest, Hodenpyl, Frick, Hicks; *tripartita* R. Smith. Country Life Press; var. *barbadensis* Gord. Bermuda Juniper, Frick; var. *Schottii* Gord. Country Life Press.

Ketelleeria davidiana Beiss. W. China. Frick.

Larix dahurica Turcz. Dahurican Larch. Frick.

Larix eurolepis Henry. Frick.

Larix decidua Mill. European Larch. Havemeyer, Matheson, DeForest, Hodenpyl, Hicks, Bailey, Frick. Var. *pendula* Kuntze, Frick.

Larix laricina K. Koch (L. *americana*, Michx.) Tamarack, Frick.

Larix leptolepis Murr. (L. *Kaempferi*, Sarg.) Japanese Larch. Hicks, Bailey, Havemeyer, Pratt, Frick.

Larix Lyalli Parl. Lyall Larch. Frick.

Larix occidentalis Nutt. Western Larch.

Larix potanini Batol (*L. thibetica* Franch) China Larch. Frick.

Larix Wilson "(No. 10508)." Frick.

Libocedrus chilensis Endl. Chilean Incense. Frick. Var: *viridis* SPN, Frick.

Libocedrus decurrens Torr. California Incense. Cedar, Havemeyer, Frick.

Picea Alcockiana Carr. (P. *bicolor*, Mayr.) Alcock Spruce. Bailey, Hicks, Havemeyer, Dana Island, Frick.

Picea ascendens Patschke. West China Spruce. Frick.

Picea asperata Mast. West China Spruce. Frick, Country Life Press, Hodenpyl; var. *notabilis* Rehd. & Wilson. Frick,

Country Life Press; *ponderosa* Rehd. and Wilson, Frick.
Country Life Press; var. *Balfouriana* Hort., Country Life Press.
Picea aurantiaca Mast. West China Spruce. Frick.
Picea Balfouriana Rehd. and Wilson. W. China Spruce. Frick.
Picea brachytyla Pritz. West China Spruce. Frick.
Picea Breweriana Wats. Oregon Weeping Spruce. Frick.
Picea canadensis BSP. (*P. glauca,* Voss.) White Spruce. Hicks, Bailey, Frick, Hodenpyl, Willys, Matheson, Havemeyer; var. *albertiana* Sarg. (Alberta Spruce), Hicks, Bailey; var. *caerulea* Rehd. (silver white spruce), Matheson, Frick, *aurea-nana* SPN, Frick; var. *albertiana conica* SPN, *albertiana Webbiana* SPN, *Engelmanni* SPN, Frick.
Picea complanata Mast. West China Spruce. Frick.
Picea Engelmanni (Engelm.) Engelmann Spruce. Bailey, Frick, DeForest, Hicks, Havemeyer, Dana Island, Country Life Press; var. *glauca* Beiss, (Blue Engelmann Spruce). Bailey, Frick.
Picea excelsa Link (*P. Abies* Karst) Norway Spruce. Tiffany, Bailey, Havemeyer, Hicks, Kahn, Pratt, Frick, Country Life Press; var. *compacta* Nash. (Globe Norway spruce), Matheson, Frick; var. *inverta* Hort.; var. *dumosa* Hort.; var. *Maxwelli* Nash; var. *pygmaea* Rehd. Pigmy Norway Spruce; var. *nana* Nash. Country Life Press. Vars: *aurea* Nash, *inversa* Nash, *pyramidalis* Voss, *conica* Th. Fries, *barryi* Nash, *gregoryana* Nash, *maxwelli* Nash, *accrona* SPN, *Ellwangeriana* Rehd.; *parviformis* Rehd.; *pumila* Nash, *pumila nigra* Nash, *Remontii* Rehd, *"sieboldii"* SPN, *monstrosa* Rehd, *monstrosa pygmaea* SPN, *Nidiformis* Rehd, *Ohlendorfi* SPN, *Merkii* Rehd., *brevifolia* SPN, *clanbraziliana* Th. Fries, Frick, Country Life Press; *mictosperma* Rehd., *procumbens* Rehd, *echiniformis* SPN, Frick; *pendula Nash,* Frick.
Picea glauca Voss. White Spruce. Country Life Press.
Picea Glehnii Mast. Sakhalin Spruce. Frick.
Picea heterolepis Rehd. & Wilson. West China spruce. Frick.

Picea jezoensis Maxim. Yeddo Spruce, Frick. Var. *Honodoensis* Rehd. (Hondo spruce), Frick.

Picea Koyamai Shiras. Havemeyer, Hodenpyl, Frick.

Picea likiangenis Pritz. West China Spruce. Frick.

Picea mariana BSP (German) Black Spruce. Frick, Country Life Press. Var. *Doumetti* Sudw., Frick.

Picea Maximowiczi Regel. Japanese Bush Spruce. Hicks, Frick.

Picea Meyeri Rehd. and Wils. N. China Spruce. Frick.

Picea montigena Mast. West China Spruce. Frick.

Picea obovata Ledeb. Siberian Spruce. Hodenpyl, Hicks, Frick.

Picea Omorika Bolle. Serbian Spruce. Bailey, Hicks, Pratt, Havemeyer, Frick, Country Life Press. Var. *pendula* SPN. Frick.

Picea orientalis Carr. Oriental spruce. Bailey, Hicks, Matheson, Havemeyer, Country Life Press, Pratt, Frick. Var. *nana* Carr., dwarf oriental spruce Carr. Frick, Country Life Press.

Picea polita Carr. Tigertail spruce. Matheson, Hicks, Bailey, DeForest, Pratt, Frick, Country Life Press.

Picea pungens Engelm. Colorado Spruce. Frick, Pratt, Hicks, Matheson, Bailey, Havemeyer, Hodenpyl, Country Life Press. Var. *glauca* Beiss, Colorado Blue Spruce. Frick, Bailey, Matheson. Var. *Kosteri pendula* SPN. Frick; *argentea* Beiss, Country Life Press.

Picea purpurea Mast. West China spruce. Frick.

Picea retroflexa Mast. West China spruce. Frick, Country Life Press.

Picea rubra Link. Red Spruce. Frick. Var. *virgata* Rehd., *monstrosa* SPN. Frick.

Picea Sargentiana Rehd. & Wils. West China Spruce. Frick.

"Picea Schneider No. 455" SPN. West China Spruce. Frick, Hodenpyl.

Picea Schrenkiana Fisch and Mey. Schrenk Spruce. Hicks, Frick. Var. *"Wilsoni* No. 11249?" Frick.

Picea sitchensis Carr. Sitka Spruce. Bailey, Frick.

Picea Smithiana Beiss. Himalayan Spruce. Dana Island, Havemeyer, Frick.

Picea "yunnanensis SPN. West China Spruce. Frick.

Pinus "aristata" SPN. Bristlecone Pine. Bailey, Hicks, Frick.

Pinus Armandi Franch. Armand Pine. Bailey, Hicks, Frick.

Pinus attenuata Lamm. (P. *tuberculata* Gord.) Knob-Cone Pine. Frick.

Pinus Ayacahuite Ehrenb. Mexican White Pine. Frick.

Pinus Balfouriana Jeffrey. Foxtail Pine. Bailey.

Pinus Banksiana Lamb. Jack Pine. Bailey, Hicks, Frick, Country Life Press.

Pinus Bungeana Zucc. Lacebark Pine. Hodenpyl, Bailey, Hicks, Frick.

Pinus canariensis C. Smith. Canary Pine. Havemeyer, Frick.

Pinus caribea Morelet. Swamp Pine. Frick.

Pinus cembra L. Swiss Stone Pine. Bailey, Hicks, Havemeyer, Pratt, Frick, Country Life Press. Var. *siberica* Loud. (Siberian Stone Pine), Frick, Country Life Press.

Pinus contorta Dougl. Shore Pine. Frick. Var. *latifolia* Engelm, (Lodge Pole Pine), Frick.

Pinus Coulteri D. Don. Big Cone Pine. Frick.

Pinus densiflora Sieb. and Zucc. Japanese red pine. Hodenpyl, Havemeyer, Dana Island, Bailey, Hicks, Frick. Var. *umbraculifera* Mayr., (Tanyosha Pine), Tiffany, Hodenpyl, Frick, Country Life Press; var. *pendula* Mayr., *oculis draconis* (Dragon Eye Pine), Frick.

Pinus echinata Mill. Shortleaf Pine. Frick.

Pinus edulis (*P. cembroides Zucc.* var. *edulis*, Voss.) Nut Pine. Frick.

Pinus excelsa Wall. Himalayan Pine. Havemeyer, Pratt, Dana Island, Frick.

Pinus flexilis James. Limber Pine. Hodenpyl, Hicks, Bailey, Frick.

Pinus Gerardiana Wall. Frick.

Pinus halepensis Mill. Aleppo Pine. Dana Island. Frick.

Pinus Jeffreyi Balfour. Jeffrey Pine. Hicks, Bailey, Frick.

Pinus koraiensis Sieb. and Zucc. Korean Pine. Bailey, Hicks, Frick.

Pinus Lambertiana Dougl. Sugar Pine. Frick.

Pinus leucodermis Ant. Balkan Gray-Bark Pine. Frick.

Pinus Massoniana Lamb. Dana Island, Havemeyer, Frick.

Pinus monophylla Voss. Single Leaf Pine. Frick.

Pinus montana Mill. Swiss Mountain Pine. Bailey, Pratt, Havemeyer, Frick, Country Life Press; var. *mughus* Zenari (Mugho Pine), Bailey, Tiffany, Willys, Hodenpyl, Hicks, County Life Press, Frick; var. *mughus prostrata* Tubeuf (?), Frick.

Pinus monticola Don. Western White Pine. Bailey, Hicks, Frick.

Pinus muricata Don. Bishop Pine. Frick.

Pinus nigra Arnold. Austrain Pine. Pratt, Bailey, Frick, Hodenpyl, Hicks, Tiffany, Havemeyer; var. *Poiretiana* Asch and Groebn. (Austrian Pine), Hicks, Frick; *austriaca* Asch and Groeben; *cebennensis*, Frick.

Pinus palustris Mill. Longleaf Pine. Frick.

Pinus parviflora Sieb. & Zucc. Japanese White Pine. Bailey, Hodenpyl, Hicks, Frick; var. *glauca* Beiss; *pentaphylla* Henry; *nana* (?), Frick.

Pinus Peuce Griseb. Macedonian Pine. Bailey, Hicks, Frick.

Pinus Pinaster Ait. Cluster Pine. Frick. Var. *Hamiltoni* SPN, Frick.

Pinus pinea L. Italian Stone Pine. Bailey, Frick.

Pinus ponderosa Dougl. Western Yellow Pine. Bailey, Hicks, Frick, Country Life Press.

Pinus pumila Regel. Dwarf Stone Pine. Frick.

Pinus pungens Lamb. Table Mountain Pine. Frick.

Pinus radiata Don. Monterey Pine. Frick.

Pinus resinosa Ait. Red Pine. Bailey, Hicks, Frick, Country Life Press.

Pinus rigida Mill. Pitch Pine. Frick.

Pinus Sabiniana Dougl. Digger Pine. Frick.

Pinus sinensis Lamb. China Pine. Frick.

Pinus strobus L. White Pine. Bailey, Frick, Tiffany, DeForest, Hodenpyl, Hicks, Havemeyer, Pratt; var. *glauca* Beiss (Blue White Pine), DeForest, Frick; var. *nana* Knight, Frick; var. *fastigiata* Beiss, Frick.

Pinus sylvestris L. Scotch Pine. Bailey, Hodenpyl, Hicks, Havemeyer, Pratt, Frick. Var. *Watereri* Rehd. *Argentea* Steven, Frick.

Pinus Taeda L. Loblolly Pine. Frick.

Pinus Thunbergii Parl. Japanese Black Pine. Bailey, Hicks, Dana Island, Havemeyer, Frick, Country Life Press.

Pinus Torreyana Carr. Torrey Pine. Frick.

Pinus "taiwanensis" Hort. Formosa Pine. Frick.

Pseudotsuga douglassi Carr. (P. *taxifolia* Britt) Douglas Fir. Pratt, Hodenpyl, Bailey, Havemeyer, Tiffany, Matheson, Hicks, Frick. Var. "gray" (Colorado) Frick. *glauca* Sudw., *pendula glauca* Schneid, Frick.

Pseudotsuga japonica Beiss. (*Tsuga Japonica* Hort.) Hodenpyl.

Sciadopitys verticillata Sieb. & Zucc. Umbrella Pine. Pratt, Bailey, Tiffany, Hicks, Hodenpyl, Havemeyer, Frick, Country Life Press.

Sequoia gigantea Dc. Giant Sequoia. Frick, Hicks, Havemeyer. Var. *pendula* Lav. *glauca* Otto, Frick.

Sequoia sempervirens Endl. Coast Redwood. Frick. Var. *glauca* R. Smith, Frick.

Taiwania cryptomerioides Hayata. Formosa Taiwania. Frick.

Taxodium distichum Rich. Common Bald Cypress. Matheson, Hodenpyl, Hicks, Bailey, Frick. Var. *"glauca"* Frick, *imbricaria* Nutt. (Common Bald Cypress), Garden City.

Taxodium mucronatum Ten. Montezuma Cypress. Frick.

Thuja globosa Hort. Globe Arbor Vitae. Var. *nana* Hort. Country Life Press.

Thuja koraiensis Nakai. Korean Arbor-vitae. Bailey, Hodenpyl, Frick, Country Life Press.

Thuja occidentalis L. Arbor vitae. Bailey, Tiffany, DeForest, Hodenpyl, Matheson, Hicks, Pratt, Frick. Vars: *Compacta* Beiss, *"Brikerhoffi"* Hort., *Burrowii* Hort., *Douglassii*

aurea Hort., *Riversii* Beiss, *"Reidii"* Hort., *pendula* Gord., Frick, Bailey, DeForest, Frick, Country Life Press; *aureo-variegata* Beiss (*Wareana aurea*), Frick; *Rosenthali* Ohlend (*Lobbi*), Frick, Bailey; *umbraculifera* Beiss, Frick; *dumosa*, Frick; *"pumila,"* Frick; *globosa* Beiss, Frick, Bailey, Matheson, Hodenpyl; *recurva nana*, Frick; *robusta* Carr. (*siberica Wareana*), Frick; *spiralis* Hort., Frick, Country Life Press; *vervaeneana* Henck and Hochst, Frick, Bailey; *columbia* Hort., Frick; *lutea* Gord., Bailey, DeForest, Frick, Country Life Press; *robusta* Carr., Frick, Bailey; var. *"tatarica"* Hort. (little gem), Frick, Bailey; *"Wagneri"* Hort., Frick; *intermedia* Hort., Frick; *ericoides* Beiss and Hochst (Health Arborvitae), Hicks, Bailey, Frick; *Ohlendorffi* Beiss (*Spaethii*), Frick; *filiformis* Beiss (?), Frick; (Threadtwig), Frick; *fastigiata Jaeger* (American Pyramidal Arborvitae), Country Life Press.

Thuja orientalis L. Oriental Arbor Vitae. Pratt, Havemeyer, Frick, Country Life Press. Var: *conspicua* Berckmanns; (*aurea conspicua*) Hort., Frick; *nana aurea* Hort., Frick, Bailey; *aurea Berkmanii* Hort., Frick; *stricta* Loud., Frick, Bailey; *"pyramidalis aurea"* Hort.; *semperaurescens* Nichols, Frick; *flagelliformis* Jacq. (*filiformis*), Frick; *"Wilsoni* (Korean)" Frick; *"Wilsoni aurea"* Frick; *aurea Dauvesse* Bailey, Hodenpyl.

Thuja plicata D. Don. Giant Arborvitae. Bailey, Hicks, Havemeyer. Var. *gigantea* Hort.; *gigantea aurea* Hort. Frick.

Thuja Standishii Carr. Standish Aborvitae. Bailey, Hicks, Dana Island, Frick, Country Life Press.

Thujopsis dolabrata Sieb. & Zucc. False Arborvitae. Bailey, Hicks, Dana Island, Frick.

Tsuga canadensis Carr. Hemlock. Hodenpyl, Kahn, DeForest, Bailey, Hicks, Tiffany, Country Life Press, Matheson, Pratt, Havemeyer. *"Atrovirens"* Hort. compact Canadian Hemlock. Country Life Press; *gracilis* Beiss; *compacta* Senecl; *Sargentii pendula* Hort. (Sargent's Weeping Hemlock) Frick; *Hicksii* Hort., Country Life Press.

Tsuga canadensis Carr. Hemlock. Hodenpyl, Kahn, DeForest. est, Hodenpyl, Hicks, Pratt, Havemeyer, Frick.
Tsuga diversifolia Mast. Japanese Hemlock. Bailey, Hicks, Frick.
Tsuga heterophylla Sarg. Western Hemlock. Frick.
Tsuga Mortensiana Sarg. Mountain Hemlock. Frick. Var. *glauca* Hort., Frick.
Tsuga Sieboldii Carr. Siebold Hemlock. Dana Island, Havemeyer, Frick, Country Life Press.
Tsuga yunnanensis Mast. Yunnan Hemlock. Frick.

SUB-DIVISION II. ANGIOSPERMAE.

CLASS I. MONOCOTYLEDONEAE.

ORDER I. PANDANALES.

TYPHACEAE.

Typha angustifolia L. Narrowleaf Cat-tail. Hodenpyl.
Typha latifolia L. Common Cat-tail. Hodenpyl.

PANDANACEAE.

Pandanus utilis Bory. Common Screwpine. Matheson.
Pandanus Veitchi Dall. Veitch Screwpine. Tiffany, Willys.

ORDER II. HELOBIAE (NAJADALES)

APONOGETONACEAE.

Aponogeton distachyus L. Cape Pond-Weed. Hodenpyl.

ALISMACEAE.

Sagittaria montevidensis Cham. & Schlecht. Giant Arrowhead. Havemeyer.
Sagittaria rigida Pursh. Stiff Arrowhead. Hodenpyl.

ORDER IV. GLUMIFLORAE (GRAMINALES)

GRAMINEAE.

Agrostis palustris Huds. Redtop. Havemeyer.
Arundinaria japonica Sieb. & Zucc. Arrow Bamboo. Tiffany, Matheson.

Arundo Donax L. Giant Reed. Hodenpyl.
Avena sativa L. Oat. Hodenpyl, Davenport.
Bambusa disticha Mitf. Fern Bamboo. Havemeyer.
Bromus macrostachys Desf. Bromegrass. Havemeyer.
Dactylis glomerata L. Orchard Grass. Hodenpyl, DeForest.
Eulalia japonica Trin. var. *gracillima* Hitchc. (*Miscanthus sinensis* Anderss.) Maiden Grass. Anders Eulalia. Hodenpyl.
Festuca glauca Lam. (F. *ovina* L.) Blue Fescue. DeForest, Hicks.
Lolium perenne L. English Rye Grass. Havemeyer.
Notholcus lanatus Nash. Velvet Grass. DeForest.
Pennisetum Ruppelii Steud. Fountain Grass. Havemeyer; var. *cupreum* Hort. Purple Fountain Grass. Matheson.
Phalaris arundinacea L. Reed Canary Grass. Hodenpyl.
Saccharum officinarum L. Sugar Cane in cultivation. C. S. H. vicinity.
Triticum aestivum L. Wheat. C. S. H.
Uniola latifolia L. Broadleaf Uniola. Hodenpyl.
Zea Mays L. Indian Corn. C. S. H. gardens.

CYPERACEAE.

Carex Fraseri Andrews. Fraser Sedge. Hodenpyl.
Cyperus alternifolius L. Umbrella Sedge. Matheson.
Cyperus esculentus L. Chufa. Havemeyer.

ORDER V. PRINCIPES.

PALMACEAE.

Chrysalidocarpus lutescens Wendl. Matheson.
Cocos (*Syagrus*) *Weddellina* Becc. Weddel Palm. Willys.
Howea Belmoreana Becc. Belmore Palm. Tiffany, Willys, Matheson.
Howea Forsteriana Becc. Forster Palm. Tiffany, Willys.
Latania (*Livistona*) *Commersoni* Gmel. Latania. Matheson.
Loroma amethystina Cook (?) (*Seaforthia elegans*) Matheson, Willys.

Phoenix reclinata Jacq. Senegal Date Palm. Matheson.
Phoenix Roebelini O'Brien. Roebelen Palm. Tiffany, Willys.

ORDER VII. SPATHIFLORAE (ARALES).

ARACEAE.

Acorus Calamus L. Sweet Flag. Hodenpyl.
Alocasia indica Schott. Giant Taro. Tiffany.
Anthurium Scherzerianum Schott. Common Anthurium. Tiffany.
Arisaema triphyllum (L) Schott. Jack-in-the-Pulpit. Hodenpyl.
Calla palustris L. Wild Calla. Hodenpyl.
Colocasia esculenta Schott. Elephants-Ear. Dasheen, Tiffany.
Orontium aquaticum L. Golden club. Hodenpyl.
Philodendron verrucosum Math. & Havemeyer.
Peltandra virginica (L) Kunth. Virginia Arrow-Arum. Hodenpyl.
Zantedeschia aethiopica Spreng. Calla. Tiffany, Willys.
Zantedeschia Elliottiana Engler. Golden Calla. Willys, Kahn, Bailey.

ORDER VIII. FARINOSAE (XYRIDALES)

COMMELINACEAE.

Tradescantia bracteata Small. Bracted Spider wort. Tiffany.
Tradescantia fluminensis Vell. Wandering Jew. Havemeyer.
Tradescantia virginiana L. Virginia Spider wort. Hodenpyl, Hicks, Pratt.

ORDER IX. LILIIFLORAE (LILIALES)

LILIACEAE.

Agapanthus africanus Hoffmg. (*A. umbellatus*) African Lily. Matheson.
Allium canadense L. Meadow Garlic. Bailey.
Allium Moly L. Lily Leek. Hodenpyl.
Anthericum Liliago L. St. Bernard Lily. DeForest, Hodenpyl.

Asparagus officinalis var. *altilis* L. Common Asparagus. Hodenpyl, DeForest.

Asparagus plumosus Baker. Fern Asparagus. Tiffany, Willys, Matheson, Kahn, Pratt.

Asparagus Sprengeri Regel. Willys, Matheson, Bailey, Kahn, Tiffany, Pratt.

Aspidistra lurida Hort. (*A. elatior* Blume) Common Aspidistra. Willys, Tiffany, Pratt, Havemeyer.

Brodiaea uniflora Baker. Spring-Star-Flower. Hodenpyl.

Calochortus Catalinae Wats. Catalina Mariposa. Hodenpyl.

Calochortus luteus Dougl. Var: *vestae* Hort. (?) Vesta Mariposa. Hodenpyl.

Calochortus venustus Benth. Var: Butterfly Tulip, *El Dorado*. Hodenpyl.

Camassia Cusicki Wats. Cusick Camass. DeForest.

Camassia Quamash Greene. Common Camas. Hodenpyl.

Chionodoxa Luciliae Beiss. Glory-of-the-snow. Matheson, DeForest, Hodenpyl, Havemeyer, Pratt.

Chlorophytum elatum R. Br. Matheson.

Clintonia borealis Raf. Bluebeard. Hodenpyl.

Clintonia umbellulata (Michx.) Morong. Speckled Clintonia. Hodenpyl.

Colchicum autumnale L. Autumn Crocus. Pratt, Havemeyer.

Convallaria majalis L. Lily-of-the-Valley. Bailey, Hodenpyl, DeForest, Matheson, Tiffany, Hicks, Pratt, Havemeyer.

Dracaena Sanderiana Sander. Tiffany.

Dracaena deremensis Engler. Pratt.

Eremurus himalaicus Baker. Himalayan-Desert Candle. Bailey, Havemeyer.

Eremurus robustus Regel. Pratt.

Erythronium albidum Nutt. White Trout lily. Hodenpyl.

Erythronium americanum Smith. Common Trout lily. DeForest, Hodenpyl.

Erythronium Dens-Canis L. Dog-Tooth Violet. Pratt. Var: *album* Hort. Var: *roseum* Hort. Hodenpyl.

Fritillaria imperialis L. Crown-imperial. Bailey, Tiffany, Hodenpyl, Havemeyer.

Fritillaria meleagris L. Checkered Fritillary. Hodenpyl, Havemeyer, Pratt.

Funkia ovata Spreng (*Hosta caerulea* Tratt.) Hodenpyl.

Funkia subcordata Spreng. (*Hosta plantaginea* Aschers) Day Lily. Havemeyer.

Galtonia candicans Decne. Summer Hyacinth. Matheson, Havemeyer, Pratt.

Hemerocallis aurantiaca Baker. Orange Day Lily. Pratt, Havemeyer.

Hemerocallis citrina Baroni. Citron Day Lily. Hodenpyl.

Hemerocallis Dumortieri Mort. Early Day Lily. Hodenpyl, DeForest, Hicks, Bailey.

Hemerocallis flava L. Yellow Day Lily. Matheson, Kahn, Hodenpyl, Pratt, DeForest, Havemeyer, Tiffany, Bailey, Hicks, Country Life Press.

Hemerocallis fulva L. Common Orange Day-Lily. Hodenpyl, Pratt. Var. *"Kwanso"* Hort. Hodenpyl.

Hemerocallis minor Mill. Hodenpyl, Country Life Press.

Hemerocallis Middendorffi Tratt. Amur Day Lily. DeForest, Hodenpyl, Hicks.

Hemerocallis ochroleuca Hort. Country Life Press.

Hemerocallis Thunbergii Baker. Matheson, Tiffany, DeForest, Pratt, Havemeyer, Kahn, Hodenpyl, Bailey, Hicks, Country Life Press.

Hosta caerulea Tratt. Blue Plantain lily. Tiffany, Matheson, Hodenpyl, DeForest, Hicks, Havemeyer.

Hosta Fortunei Bailey. Fortune Plantain-Lily. Havemeyer.

Hosta lancifolia Tratt (*undulata*, Bailey) Lanceleaf plantain lily. Tiffany, Matheson, DeForest, Hodenpyl, Hicks.

Hosta plantaginea Aschers. Large White Plantain-Lily. Matheson, DeForest, Tiffany, Hodenpyl. Var: *grandiflora* Hort. Hodenpyl, Hicks, Country Life Press.

Hosta Sieboldiana Engler. Cushion Plantain Lily. Matheson, Kahn, Hodenpyl, Havemeyer, Pratt.

Hyacinthus orientalis L. Common Hyacinth. Havemeyer.

Kniphofia corallina Hort. (*K. Macowanii* Baker) Coral Torch Lily. Bailey, Hodenpyl, Hicks.

Kniphofia Uvaria Hook. Common Torch Lily. Matheson, Hodenpyl. Var: *Pfitzeriana* (Bonfire Torchlily.) Hodenpyl.

Lapageria rosea Ruiz and Pav. Red Chile-Bells. Havemeyer.

Leucocrinum montanum Nutt. Sand lily of Colorado. Hodenpyl.

Lilium auratum Lindl. Golden-banded Lily. Bailey, Tiffany, Willys, Matheson, DeForest, Hodenpyl, Hicks, Havemeyer, Pratt, DeForest.

Lilium Brownii F. E. Brown, Brown's Lily. Havemeyer.

Lilium canadense L. Canada Lily. Bailey, Willys.

Lilium candidum L. Madonna Lily. Tiffany, Willys, Matheson, Kahn, DeForest, Hodenpyl, Hicks, Havemeyer, Pratt, Country Life Press.

Lilium chalcedonicum L. Scarlet Turks-Cap Lily. Havemeyer.

Lilium croceum Chaix. Orange Lily. Havemeyer.

Lilium elegans Thunb. Hodenpyl, Havemeyer.

Lilium Grayi Wats. Grays Lily. Hodenpyl.

Lilium Hansoni Leicht. Hanson Lily. Hodenpyl, Havemeyer.

Lilium Henryi Baker. Henry Lily. Bailey, DeForest, Havemeyer, Pratt.

Lilium Humboldti Roezl. & Leicht. Humboldt Lily. Hodenpyl, Havemeyer.

Lilium japonicum Thunb. Japanese Lily. Havemeyer.

Lilium longiflorum Thunb. Easter Lily. Havemeyer.

Lilium Martagon L. Martagon Lily. Bailey, Hodenpyl, Havemeyer.

Lilium monadelphum Marsh & Bieb. Caucasian Lily. Hodenpyl.

Lilium pardalinum Kellog. Leopard Lily. Havemeyer.

Lilium philadelphicum L. Orange cup Lily. Hodenpyl.

Lilium regale Wils. Royal Lily. Matheson, DeForest, Hodenpyl, Bailey, Hicks, Havemeyer, Pratt.

Lilium rubellum Baker. Rubellum Lily. DeForest, Havemeyer.

Lilium Sargentiae Wils. Sargent Lily. Havemeyer.

Lilium speciosum Thunb. Speciosum Lily. DeForest, Hodenpyl, Havemeyer, Pratt. Var: *Melpomene* Hort. Willys.

Lilium superbum L. American Turkscap Lily. Hodenpyl, Matheson. Var: *Carolinianum* Chapin. Hodenpyl.

Lilium tenuifolium Fisch. Coral Lily. DeForest, Hodenpyl, Bailey, Havemeyer.

Lilium testaceum Lindl. Nankeen Lily. DeForest, Havemeyer, Pratt.

Lilium tigrinum Ker. Tiger Lily. Tiffany, DeForest, Hodenpyl, Hicks, Bailey, Havemeyer.

Lilium Washingtonianum Kellogg. Washington Lily. Hodenpyl, Havemeyer, Hicks, Bailey, Havemeyer.

Maianthemum bifolium Hort. (*M. convallaria* Weber). Hodenpyl, Tiffany, DeForest.

Medeola viginica L. Cucumber-Root. Hodenpyl.

Muscari botryoides Mill. Common Grape-Hyacinth. Hicks, Havemeyer, Pratt.

Ophiopogon japonicus Ker. Japanese Snake beard. Matheson. Var: *jaburan aureus variegatus* Hort. Goldstripe Jaburan. Matheson.

Ornithogalum nutans L. Hodenpyl, Pratt.

Ornithogalum umbellatum L. Common star-of-Bethlehem. Bailey, Tiffany, DeForest, Hodenpyl.

Paradisea iliastrum Bert. St. Bruno-Lily. Hodenpyl.

Polygonatum biflorum (Walt.) Ell. Small Solomon's Seal. DeForest, Matheson, Hodenpyl, Tiffany, Hicks.

Polygonatum majus Hort. Hodenpyl.

Polygonatum commutatum (R. & S.) Dietr. Great Solomon Seal. Hodenpyl.

Puschkinia scilloides var. *libanotica* Beiss. Hodenpyl.

Rohdea japonica Roth. Havemeyer.

Sansevieria thyrsiflora Thunb. Havemeyer.

Scilla bifolia L. Twinleaf Squill. DeForest, Hodenpyl.

Scilla hispanica Mill. Spanish Squill. DeForest, Hodenpyl, Havemeyer.

Scilla nonscripta Hoffm. & Link. Common Blue Squill. Tiffany, Kahn, DeForest, Hodenpyl.

Scilla sibirica Andr. Siberian Squill. DeForest, Hodenpyl, Havemeyer, Pratt.

Smilacina racemosa (L) Desf. False Solomon Seal. Bailey, Hodenpyl.

Smilax officinalis H. B. K. Havemeyer.

Stenanthium robustum Wats. Feather fleece. Bailey, Matheson.

Tricyrtis hirta Hook. Hairy Toad Lily. Hodenpyl.

Trillium cernuum L. Nodding Trillium. Hodenpyl.

Trillium erectum L. Purple Trillium. Tiffany, Matheson, DeForest, Hodenpyl, Bailey.

Trillium grandiflorum (Michx.) Salisb. Snow Trillium. Bailey, DeForest, Hodenpyl, Country Life Press.

Trillium ovatum Pursh. Pacific Trillium. Hodenpyl.

Trillium sessile L. Rea Wake Robin. Country Life Press. Var: *giganteum* Torr. California Trillium. Hodenpyl.

Trillium stylosum Nutt. Rose Trillium. Hodenpyl.

Trillium undulatum Willd. Painted Trillium. Country Life Press.

Tulipa elusiana Vent. Lady Tulip. Pratt.

Tulipa Kaufmanniana Regel. Water-Lily Tulip. Pratt.

Tulipa—Horticultural varieties.

Aphrodite, Dar. Kahn.
Cardinal Manning, Bre. Kahn.
Clara Butt, Dar. Kahn, Matheson.
Earncombe Sanders, Dar. Kahn.
Inglescombe Pink, Cot. Matheson.
La Tristesse, Dar. Kahn.
Inglescombe Yellow, Cott. Matheson.
La Tulipe Noire, Dar. Kahn.
Mrs. Moon. Cot, Kahn.
Rev. H. Ewbank, Dr. Kahn.

Uvularia grandiflora Sm. Big Merrybells. Hodenpyl, Country Press.

Veratrum viride Ait. American False Hellebore. Hodenpyl.

Yucca aloifolia L. Spanish-Bayonet. Hodenpyl.

Yucca filamentosa L. Adam's Needle. Hicks, Tiffany, Fish Hatchery, C. S. H., DeForest, Pratt, Havemeyer, Matheson, Bailey, Country Life Press.

Yucca glauca Nutt. Soapweed Yucca. Matheson.

AMARYLLIDACEAE.

Agave americana L. Century Plant. Tiffany.
Clivia miniata Regel. Scarlet Kafir Lily. Pratt.
Galanthus Cilicicus Baker. Hodenpyl.
Galanthus Elwesii Hook. Giant Snowdrop. Pratt, Havemeyer, Hodenpyl.
Galanthus nivalis L. Snowdrop. Havemeyer, Hodenpyl, Pratt.
Hippeastrum vittatum Herb. Havemeyer.
Hymenocallis macrostephana Baker. Spider Lily. Havemeyer.
Hypoxis hirsuta (L.) Coville. Goldeye Grass. Hodenpyl.
Leucojum aestivum L. Summer Snowflake. DeForest, Hodenpyl.
Leucojum autumnale L. Hodenpyl.
Leucojum vernum L. Spring Snowflake. DeForest, Hodenpyl, Pratt.
Lycoris squamigera Maxim. Amaryllis. Bailey, Hicks, Havemeyer.
Narcissus biflorus Curt. Primrose Peerless. Havemeyer.
Narcissus bulbocodium L. Petticoat Daffodil. Hodenpyl.
Narcissus giganteus Hort. Hodenpyl.
Narcissus incomparabilis Hill. Halfskirt Daffodil. Hodenpyl, Pratt, Havemeyer.
Narcissus juncifolius Lag. Havemeyer.
Narcissus poeticus L. Poets' Narcissus. Matheson, Hodenpyl, Tiffany, Willys, Havemeyer, Pratt. Var: *ornatus* Hort. (Early Poets Narcissus). Matheson, Willys, Tiffany.
Narcissus Pseudo-Narcissus L. Daffodil. Bailey, Tiffany, C. S. H. village, Willys, Pratt.
Narcissus Tazetta L. Polyanthus Narcissus. Pratt.
Narcissus triandrus L. Havemeyer.
Nerine sarniensis L. (Sarniense Herb.) Guernsey Lily. Matheson, Havemeyer.

IRIDACEAE.

Belamcanda chinensis DC. Blackberry-Lily. C. S. H. vicinity. Hodenpyl.
Crocus biflorus Mill. Scotch Crocus. Havemeyer, Pratt.

Crocus susianus Ker. Cloth-of-Gold Crocus. Havemeyer.

Crocus vernus All. Common Crocus. Havemeyer, Pratt.

Freesia refracta Klatt. Havemeyer. Var: *alba* Baker. Willys, Tiffany; *"General Pershing,"* Tiffany, Willys; *Purity,* Willys.

Gladiolus Colvillei Sweet. Havemeyer.

Gladiolus gandavensis Van Houtte. Havemeyer.

Gladiolus Lemoinei Hort. Havemeyer.

Gladiolus primulinus Baker. Primrose Gladiolus. Willys, Havemeyer.

Gladiolus—Horticultural varieties:

Alice Tiplady, Prim. (Kund. 1915) Matheson.
America (Chi. 1906) Tiffany, Willys, Matheson.
Attraction, Prim. (Chaut. 1921) Willys.
Baron J. Hulat (Lem. 1896) Willys.
Bluejay (Groff 1904) Tiffany, Willys.
Ida Vann (Kund. 1913) Matheson.
Kunderd Glory (Kund. 1911) Matheson.
Loveliness, Prim. (Chaut. 1921) Willys.
Mrs. Dr. Norton (Kund. 1915) Willys.
Mrs. Francis King (Cob Vaug. 1906) Willys.
Mrs. Frank Pendleton (Kund. 1913) Willys.
Peace (Groff 1899) Matheson.
Prince of Wales (Van z. 1913) Matheson.
Schwaben (Pfit. 1913) Tiffany.
War (Groff-Cowee 1909) Matheson.

Iris atropurpurea Baker. Black purple Iris. Hodenpyl.

Iris cristata Air. Crested Iris. DeForest, Hodenpyl, Hicks, Matheson, Country Life Press. Var: *lacustris* Hort. Hodenpyl.

Irish flavescens DC. Havemeyer.

Iris foetidissima L. Gladwin Iris. Hodenpyl.

Iris fulva Ker. Hodenpyl.

Iris Germanica L. German Iris. Tiffany, Matheson, DeForest, Hodenpyl, Willys, Hicks, Havemeyer, Pratt. Var: *florentiana* L. Havemeyer. Var: *L'Avenir* Hort. Hodenpyl.

Iris hexagona Walt. Dixie Iris. Hodenpyl. Var. *lamancei* Hort. Hodenpyl, Matheson.

Iris Japonica Thunb. Fringed Iris. Matheson, DeForest, Hodenpyl, Havemeyer, Pratt.

Iris Kaempferi Sieb. (*I. laevigata* Fisch and Meyer.) Matheson, DeForest, Hodenpyl, Hicks, Pratt.
Iris laevigata Fisch and Meyer. Japanese Iris. Hodenpyl, Davenport, Havemeyer, Matheson.
Iris longipetala Herb. Coast Iris. Hodenpyl.
Iris missouriensis Nutt. Rocky Mountain Iris. Hodenpyl.
Iris ochroleuca L. (*I. orientalis* Mill) Yellow bond Iris. Hodenpyl, Havemeyer.
Iris pallida Lam. Sweet Iris. Havemeyer, Pratt.
Iris Pscudacorus L. Yellowflag Iris. Hodenpyl, Kahn, Havemeyer.
Iris pumila L. Tiffany, DeForest, Hodenpyl, Hicks, Havemeyer.
Iris reticulata Bieb. Netted Iris. Hodenpyl.
Iris sibirica L. Siberian Iris. Tiffany, Matheson, DeForest, Hodenpyl, Kahn, Havemeyer, Pratt.
Iris susiana L. Mourning Iris. Hodenpyl.
Iris verna L. Vernal Iris. Hodenpyl, Hicks, Country Life Press.
Iris versicolor L. Blueflag Iris. Hodenpyl.
Iris xiphioides Ehrh. English Iris. Hodenpyl.
Iris Xiphium L. Spanish Iris. Matheson, Hodenpyl.
Iris—Horticultural varieties:

Albert Victor, TB (1885) Matheson.
Apollon, TB (Lum. 1840) Hodenpyl.
Aurea, TB (Jacq. 1830) Hodenpyl.
Azure, Jap. (Chi. 1919) Matheson.
Beauty TB (1860) Matheson.
Blue Jay TB (Farr 1915) Matheson.
Blue King Sib. (Col. by Barr) Matheson.
Blue Stone DB (Per. 1903) Matheson.
Cameleon TB (Lmn. 1840) Matheson.
Celeste TB (Lmn. 1855-58) Matheson, Hodenpyl.
Citrea DB (G. & K. 1899) Matheson.
Delight TB (Sturt. 1918) Matheson.
Emperor Sib. (Named by Wol.) Matheson.
Eugene Sue TB (Lmn. 1848) Hodenpyl.
Favourite TB (1874) Matheson.
Flavescens, Matheson.

Florentine Blue, Kahn, Tiffany, Matheson, Kahn, Hodenpyl.
Gajus TB (G. & K.) Matheson.
Gold Bound Jay (Named by Hal. about 1885) Matheson.
Gracchus TB (Ware 1884 or 1887) Matheson.
Hector TB (Lmn. 1840) Hodenpyl.
Hiawatha TB (Farr 1913) Matheson.
Ignacite TB (Lmn. 1859) Hodenpyl.
Inco TB (Farr. 1922) Matheson.
Jacquesiana TB (Lmn. 1840) Hodenpyl.
James Boyd TB (Farr. 1915) Matheson.
Japanesque TB (Farr. 1922) Matheson.
Jordaens, Hodenpyl.
Lactea Sib. (1876) Matheson.
Lemon TB (Lmn. 1840) Hodenpyl.
Libaudi TB (Lmn. 1840) Hodenpyl.
Lord Wolsely Spur. (1890) Matheson.
Lorely TB (G. & K. about 1909) Matheson.
Louis Van Houtte TB (Lmn. 1840) Hodenpyl.
Maori King TB (Ware 1890) Matheson.
Mars Jap (Hal about 1885) Matheson.
Mary Garden TB (Farr. 1913) Matheson.
Mary Gray TB (Farr. 1913) Matheson.
Massasoir TB (Farr. 1916) Matheson.
Mme. Chereau TB (Lmn. 1844) Hodenpyl.
Monnieri Spur., Hodenpyl.
Monspur Spur. (Fos.) Hodenpyl.
Navaio TB (Farr. 1913) Matheson.
Nightfall Jap. (Chi.) Matheson.
Oriental TB (Farr. 1913) Matheson.
Othello Eng., Matheson.
Pallida dalmatica, Matheson.
Pancrace TB (1854) Hodenpyl.
Pawine TB (Farr. 1913) Matheson.
Paxatawny TB (Farr. 1913) Matheson.
Perry Blue Sib. (Per. 1912) Matheson.
Pocohontas TB (Farr. 1915) Matheson.
Powhatan TB (Farr. 1913) Matheson.
Princess Louise DB (Per. 1903) Matheson.
Purple King TB, Matheson.
Quaker Lady TB (Farr. 1909) Matheson.
Queen of May TB (Sal. before 1859) Matheson
Red Cloud TB (Farr. 1913) Matheson.
Red Riding Hood TB (Koch. 1922) Matheson.

Red Riding Hood Jap. (Hal. about 1855) Matheson.
Reine des Belges TB (Lmn. 1848) Matheson.
Robert Craig Jap. (Hal. about 1885) Matheson.
Samson TB (Lmn. 1840) Hodenpyl.
Sapho TB (Lmn. 1840) Hodenpyl.
Sea Gull Jap. (Hal. about 1885) Matheson.
Sea Gull TB (Farr. N) Matheson.
Seminole TB (Farr. 1920) Matheson.
Shadow Jap. (Hal. about 1885) Matheson.
Silver King, Florentine Iris, Hodenpyl.
Snow Queen Sib. (Berr. about 1900) Matheson, Kahn.
Spuria Alba Spur., Hodenpyl.
Swatara TB (Farr. 1910) Matheson.
Toledo Jap. (Chi.) Matheson.
Victorine TB (Lmn. 1840) Matheson.
Windham TB (Farr. 1909) Matheson.
Wyoming TB (B. & A. 1917) Matheson.

Ixia maculata L. Spotted Ixia. Havemeyer.
Sisyrinchium angustifolium Mill. Common Blue-Eyed Grass. Hodenpyl.
Tritonia cosmaeflora Le Moine. Horticultural varieties, Crocos. Hodenpyl. *George Davison, Golden West, Martagon,* DeForest.
Watsonia iridifolia Ker. Iris leaf Bugle Lily. Havemeyer.

ORDER X. SCITAMINEAE (SCITAMINALES).

MUSACEAE.

Musa Ensete Gmel. Abyssinian Banana. Tiffany.
Musa paradisiaca L. Var. *sapientum* Kuntze. Common Banana. Tiffany.

CANNACEAE.

Canna indica L. Indian Shot. Horticultural varieties: *Antoine Crozy, Beacon, Dr. E. Avkernecht, Duke of Marlborough, Fanal.* Matheson.

MARANTACEAE.

Maranta bicolor Ker. Havemeyer.
Maranta Closoni Hort. Closon Maranta. Tiffany.

ORDER XI. MICROSPERMAE (ORCHIDALES).

ORCHIDACEAE.

Calanthe vestitia Lindl. Havemeyer.
Calopogon pulchellus RBR. Grass-Pink Orchid. Hodenpyl.
Cattleya labiata Lindl. Havemeyer.
Cattleya Mossiae Hook. Havemeyer.
Cattleya Trianae Lindl. & Reichb. Havemeyer.
Cymbidium Lowianum Reichb. Havemeyer.
Cypripedium acaule Ait. Pink Lady Slipper. DeForest, Hodenpyl, Country Life Press.
Cypripedium insigne Wall. Tiffany.
Cypripedium parviflorum Salisb. Small Yellow Ladyslipper. DeForest, Hodenpyl.
Cypripedium spectabile Swartz. Showy Ladyslipper. Tiffany, DeForest, Hodenpyl, Country Life Press.
Dendrobium nobile Lindl. Willys.
Goodyera pubescens R. Br. Downy Rattlesnake Plantain. Hodenpyl.
Goodyera repens R. Br. Creeping Rattlesnake Plantain. Tiffany, Hodenpyl.
Habenaria blephariglottis (Willd.) Torr. White Fringe-Orchis. Hodenpyl.
Habenaria bracteata (Willd.) R. Br. Satyr Orchid. Hodenpyl.
Habenaria ciliaris (L.) R. Br. Yellow Fringe-Orchid. Hodenpyl.
Habenaria Hookeri Torr. Hooker Orchid. Hodenpyl.
Habenaria psycodes (L.) Sw. Small Purple-Fringe-Orchid. Hodenpyl.
Laelia grandis var. *tenebrosa* Lindl. and Paxt. Havemeyer.
Liparis liliifolia Rich. Richard Lily, Twayblade. Hodenpyl.
Orchis spectabilis L. Showy Orchis. Hodenpyl.
Pogonia ophioglossoides (L) Ker. Rose Pogonia. Hodenpyl.
Stanhopea Lowii Hort. Tiffany.

CLASS II. DICOTYLEDONAE.

SUB-CLASS ARCHICHLAMYDEAE.

ORDER III. SALICALES.

SALICACEAE.

Populus alba L. White Poplar. Bailey, Tiffany, Willys, DeForest, Hodenpyl. Var. *balleana* Hort. Balleana popular. Hodenpyl.

Populus deltoides Marsh. Southern Cottonwood. Willys, Hicks.

Populus grandidentata Michx. Large Toothed Aspen. C. S. H. vicinity.

Populus Lasiocarpa Oliver. Havemeyer.

Populus Maximowiczi Henry. Japanese Poplar. Bailey, Hicks.

Salix alba L. White Willow. Havemeyer. Var: *regelis* Hort. Royal Willow. Hodenpyl.

Salix babylonica L. Weeping Willow. Bailey, DeForest, Hicks, Willys, Pratt, Havemeyer. Var: *Japonica* Thunb. Japanese weeping willow. Tiffany.

Salix caprea L. Goat Willow. Bailey, Hicks.

Salix fragilis L. Brittle Willow. Willys, C.S.H. vicinity. Havemeyer.

Salix brachycarpa Hort. Hodenpyl.

Salix incana Schrank. Rosemary Willow. Pratt.

Salix irrorata Anders. Blue Stem Willow. Bailey, Hodenpyl.

Salix pentandra L. Laurel Willow. Tiffany, Hodenpyl, Matheson, Hicks, Willys.

Salix purpurea L. Purple Osier. Havemeyer.

Salix tristis Ait. Dwarf Willow. Matheson.

Salix viminalis L. Osier Willow. Havemeyer.

Salix vitellina L. Yellow Willow. Hodenpyl, along streams and roadsides, C. S. H. Var: *britzensis* Hort. (Bronze Golden Willow) Bailey, Hodenpyl; var. *aurea* Salisb. (Russian Golden Willow) Bailey, Hodenpyl.

ORDER IV. GARRYALES

GARRYACEAE.

Garrya ovata Hort. Hodenpyl.

ORDER V. MYRICALES.

MYRICACEAE.

Comptonia asplenifolia Ait. (*Myrica asplenifolia* L.) Sweet-fern. Matheson, DeForest, Hodenpyl, Hicks.

Myrica carolinensis Mill. Northern Bayberry. Bailey, DeForest, Tiffany, Hodenpyl, Hicks.

Myrica Gale L. Sweet Gale. Matheson, Hodenpyl.

ORDER VIII. JUGLANDALES.

JUGLANDACEAE.

Hicoria laciniosa Engler and Graebn. Shellbark Hickory. Tiffany, Matheson, Hodenpyl, Bailey.

Hicoria ovata (Mill) Britton. (*Carya ovata* (Mill) K. Koch.) Shagbark Hickory. Hicks.

Hicoria Pecan Britt. (*Carya pecan* Aschers & Graebn) Pecan. Havemeyer.

Juglans cathayensis Dode. Chinese Walnut. Hodenpyl.

Juglans cinerea L. Butternut. Bailey, Hodenpyl.

Juglans nigra L. Black Walnut. Bailey, Matheson, Hicks, Willys.

Juglans regia L. Persian Walnut (English walnut of common speech) Bailey, Hodenpyl; var. *japonica* Hort. Bailey, Hodenpyl, Matheson; *praeparturiens* Hort. (Bush Walnut) Hodenpyl.

Juglans Sieboldiana Maxim. Japanese Walnut. Havemeyer.

ORDER XI. FAGALES.

BETULACEAE.

Alnus incana (L.) Moench. Speckled Alder. Hodenpyl; var. *laciniata* Willd. Cutleaf Alder. Bailey.

Betula alba L. (var. *pendula Roth*) European White Birch. Bailey, Hodenpyl, Tiffany, DeForest, Kahn, Willys, Havemeyer, Pratt, Matheson. Var: *fastigiata* Hort. Pyramidal White Birch. Matheson. Var. *laciniata* Hort. Cutleaf Weeping Birch. Bailey.

Betula chinensis Hort. Hodenpyl.
Betula fontinalis Sarg. Water Birch. Hodenpyl.
Betula lutea Michx. Yellow Birch. Bailey, Hodenpyl, Hicks.
Betula nigra L. River Birch. Bailey.
Betula papyrifera Marsh. Canoe Birch. Kahn, Hodenpyl.
Betula populifolia Ait. Bray Birch. Hodenpyl, Hicks.
Betula sailoana Hort. Hodenpyl.
Carpinus Betulus L. European Hornbeam. Hicks, Bailey, Kahn, Havemeyer.
Carpinus betulus L. var. *pyramidalis* Dipp. Pyramid Hornbeam. Bailey.
Carpinus caroliniana Walt. Hornbeam. Pratt, Hodenpyl, Bailey, Hicks.
Corylus americana Walt. Hazelnut. Hicks, Hempstead plain, Bailey, Hodenpyl, Matheson.
Corylus avellana L. Filbert. Hodenpyl, Hicks, Havemeyer; var. *atropurpurea* Hort. Bailey.
Corylus colurna L. Tree Hazelnut. Hodenpyl, Hicks.
Ostrya virginiana (Mill.) K. Koch. American Hornbeam. Hicks.

FAGACEAE.

Castanea dentata Borkh. American Chestnut. Havemeyer.
Castanea japonica Blums (*C. Crenata* Sieb. & Zucc.) Japanese Chestnut. Bailey, Hodenpyl.
Castanea mollissima Blume. Hairy Chestnut. Hodenpyl.
Castanea pumila Mill. Chinquapin. Bailey, Hodenpyl.
Castanea sativa Mill. Spanish Chestnut. Tiffany, Matheson, DeForest, Hodenpyl.
Fagus americana Sweet American Beech. Tiffany, Matheson, Willys, Bailey, Hodenpyl, Hicks, DeForest. Var. *atropurpurea* Copper Beech. Hodenpyl, Pratt, Havemeyer.
Fagus Sieboldi Endl. Japanese Beech. Bailey.
Fagus sylvatica L. European Beech. Matheson, Bailey, Tiffany, DeForest, Hodenpyl, Hicks, Pratt. Var. *heterophylla* Loud. Fernleaf Beech. Bailey, Hicks; var: *pendula* Loud. Weeping Beech. Bailey, Willys, Matheson; var. *purpurea*

Ait. Purple Beech L. Matheson, Bailey, Tiffany, Hicks; var: *purpurea Riversi* Hort. Rivers Beech. Bailey; var: *tricolor* Bailey, Havemeyer. Var. *pyramidalis* Kirchn, Havemeyer.

Quercus alba L. White Oak. Tiffany, DeForest, Hodenpyl, Hicks, Bailey.

Quercus bicolor Willd. Swamp White Oak. Hicks, Bailey.

Quercus Cerris L. Turkey Oak. DeForest, Havemeyer.

Quercus coccinea Muench. Scarlet Oak. DeForest, Hodenpyl, Bailey, Hicks.

Quercus dentata Thunb. Daimyo Oak. Pratt, Havemeyer.

Quercus falcata Michx. Southern Red Oak. Hodenpyl.

Quercus ilicifolia Wang. Scrub Oak. Hicks.

Quercus imbricaria Michx. Laurel Oak. Hicks.

Quercus macrocarpa Michx. Mossycup Oak. Hodenpyl, Hicks.

Quercus marilandica Muench. Blackjack Oak. Bailey, Hicks.

Quercus palustris Muench. Pin Oak. Tiffany, Bailey, DeForest, Matheson, Hodenpyl, Hicks.

Quercus Phellos L. Willow Oak. Hicks, Hodenpyl, Matheson.

Quercus Prinus L. Chestnut Oak. Bailey, Tiffany, DeForest, Hodenpyl, Hicks.

Quercus Robur L. (*Q. pedunculata* Ehrb.) English Oak. Bailey, Hodenpyl, Matheson, Hicks, Pratt. Var: *Filicifolia* Lem. (Fernleaf English Oak) Bailey; var: *fastigiata* DC. (Pyramidal English Oak) Matheson, Hicks, Bailey.

Quercus rubra L. Common Red Oak. Bailey, Tiffany, DeForest, Hodenpyl, Hicks.

Quercus variabilis Blume. Bristletooth Oak. Hodenpyl.

Quercus stellata Wang. Post Oak. Hicks.

Quercus velutina Lam. Black Oak. Hicks.

ORDER XII. URTICALES.

ULMACEAE.

Celtis occidentalis L. Hackberry. Bailey.

Ulmus alata Michx. Winged Elm. Hodenpyl.

Ulmus americana L. American Elm. Bailey, Tiffany, DeForest, Matheson, Hodenpyl, Hicks, Havemeyer, Pratt.

Ulmus campestris L. English Elm. Bailey, C. S. H. vicinity. Willys, Tiffany, Matheson, DeForest.
Ulmus glabra Huds. Scotch Elm. Bailey, Hodenpyl, Hicks.
Ulmus hollandica Mill. Holland Elm. Bailey. Var: *vegeta* Rehd. (Huntingdon Elm) Hodenpyl.
Ulmus parvifolia Jacq. Corkbark Elm. Bailey, Tiffany, Hicks.
Ulmus pumila L. Dwarf Asiatic Elm. Havemeyer.
Zelkova serrata Makino. Sawleaf Zelkova. Bailey, Hicks.

MORACEAE.

Broussonetia papyrifera Vent. C. S. H. vicinity. Bailey.
Cannabis sativa L. Hemp. C. S. H. vicinity.
Ficus carica L. Common Fig. Matheson.
Ficus elastica Roxb. Rubber Plant. Tiffany, Matheson, Havemeyer.
Ficus pumila L. Climbing Fig. Tiffany, Matheson.
Humulus Lupulus L. European Hop. Laboratory grounds, C. S. H., Havemeyer.
Maclura pomifera Schneid. Osage Orange. Matheson, Hodenpyl, Hicks.
Morus acidosa Hort. Acid Mulberry. Hodenpyl, Hicks.
Morus alba L. White Mulberry. Pratt. Var: *tatarica* Louden. Russian Mulberry. Bailey, Tiffany, Hodenpyl.
Morus nigra L. Black Mulberry. Matheson.
Morus rubra L. Red Mulberry. Matheson, C. S. H. vicinity.

ORDER XIII. PROTEALES.

PROTEACEAE.

Grevillea robusta Cunn. Silk-Oak. Tiffany, Willys, Pratt.

ORDER XV. ARISTOLOCHIALES.

ARISTOLOCHIACEAE.

Aristolochia Sipho L. Her. (*macrophylla* Lam.) Dutchman's Pipe. Matheson, Havemeyer.
Asarum canadense L. Canada Wild Ginger. DeForest, Hodenpyl.

ORDER XVI. POLYGONALES.

POLYGONACEAE.

Eriogonum umbellatum Hort. Country Life Press.
Fagopyrum esculentum Gaertn. Common Buckwheat. C. S. H.
Polygonum alpinum All. Alpine Fleece flower. Havemeyer.
Polygonum Auberti L. Henry China Fleece Vine. Hodenpyl, Hicks, Pratt.
Polygonum baldschuanicum Regel. Silver Fleece Vine. Matheson, Bailey, Havemeyer.
Polygonum sachalinense Schmidt. Sacaline. Hodenpyl.
Rheum Rhaponticum L. Rhubarb. Tiffany, Matheson.

ORDER XVII. CENTROSPERMAE.

CHENOPODIACEAE.

Beta vulgaris L. Common Beet. Gardens, C. S. H.
Kochia scoparia Schrad. Kochia. Summer Cypress. Hicks.

AMARANTACEAE.

Amaranthus sp? Amaranth. Willys.
Celosia argentea L. Feather Cockscomb. Willys, Bailey. Var: *cristata* Kuntze, Bailey.
Celosia Huttoni Mart. Hutton Cockscomb. Tiffany.

NYCTAGINACEAE.

Abronia latifolia Esch. Yellow Sand Verbena. Havemeyer.
Bougainvillea glabra Choisy. Lesser Bugainvillea. Havemeyer.

PORTULACACEAE.

Claytonia virginica L. Virginia Springbeauty. DeForest, Hodenpyl.
Lewisia pygmaea Rob. Hodenpyl.
Portulaca grandiflora Hook. Rose Moss. Tiffany, Matheson, Havemeyer.

BASELLACEAE.

Boussingaultia baselloides HBK. Madeira Vine. Matheson.

CARYOPHYLLACEAE.

Arenaria Groenlandica (Retz.) Spreng. Greenland Sandwort. Hodenpyl.

Arenaria Michauxii Hort. Hodenpyl.

Arenaris montana L. Mountain Sandwort. Country Life Press, DeForest.

Arenaria verna L. Var. *caespitosa* Hort. Moss Sandwort. DeForest, Hodenpyl.

Cerastium grandiflorum Waldst. and Kit. Chickweed.

Cerastium tomentosum L. Snow-in-summer, Bailey, Hodenpyl, Tiffany, Matheson, Kahn, DeForest, Hicks, Havemeyer, Pratt.

Dianthus Allwoodii Hort. Hybrid Pink.

Dianthus alpestris Hort. Country Life Press.

Dianthus barbatus L. Sweet William, Bailey, Tiffany, Willys, Matheson, Laboratory grounds, C. S. H., DeForest, Hodenpyl, Hicks, Havemeyer, Pratt.

Dianthus caesius Sn. Cheddar Pink. Country Life Press.

Dianthus Caryophyllus L. Carnation, Matheson. Horticultural varieties:

Belle Washburn (B. & W. 1916) Tiffany.
Enchantress (Fish. 1903) Tiffany.
Enchantress Supreme (Dail. 1913) Tiffany.
Laddie (Dor. 1918) Kahn.
Maine Sunshine (Str. 1919) Kahn, Tiffany.
Matchless (Cot. 1912) Kahn.
White Perfection (or. 1906) Tiffany.
White Wonder (Dor. 1910) Kahn.

Dianthus chinensis L. Hodenpyl, Country Life Press, Havemeyer, Pratt.

Dianthus deltoides L. Maiden Pink, DeForest, Hicks. Var. *alba* Hort, *aloima* Hort, *rubra* Hort, Country Life Press.

Dianthus essexwitch Hort. Country Life Press.

Dianthus fimbriatus Bieb. Havemeyer.

Dianthus Falconeri Hort. Country Life Press.

Dianthus glacialis Haenke. Ice Pink, Havemeyer. Var. *neglectus* Williams, Country Life Press.

Dianthus kamschaticus Hort. Country Life Press.

Dianthus plumarius L. Grass Pink. Matheson, DeForest, Hodenpyl, Bailey, Hicks, Havemeyer, Pratt. Var: *"Her Maj-*

esty," "Mrs. Sinkins," Double White Fragrant Pink, Country Life Press.

Gypsophila cerastioides D. Don. Country Life Press.

Gypsophila elegans Bieb. Common Gypsophila. Pratt, Havemeyer.

Gypsophila muralis L. Cushion Gypsophila. DeForest, Pratt.

Gypsophila paniculata L. Baby's Breath. Bailey, Havemeyer, Tiffany, Willys, Kahn, Matheson, DeForest, Hodenpyl, Hicks, Pratt; var. *florepleno* Hort. (Double Baby's Breath) Tiffany, Matheson.

Gypsophilla repens L. Creeping Gypsophila. DeForest, Hodenpyl, Country Life Press.

Herniaria glabra L. Rupture Wort. Havemeyer.

Lychnis chalcedonia L. Maltese Cross. Bailey, Hodenpyl, Hicks; var. *alba* Hort. (White Maltese Cross) Hodenpyl.

Lychnis Coronaria Desr. Mullein Pink. Matheson, Hodenpyl, Hicks.

Lychnis Flos-cuculi L. Ragged Robin. Hicks, Hodenpyl, DeForest.

Lychnis Flos-Jovis Desr. Flower-of-Jove. Hodenpyl.

Lychnis Viscaria L. Clammy Campion. Matheson, DeForest, Havemeyer.

Sagina subulata Wimm. Pearl Wort. Matheson.

Saponaria ocymoides L. Rock Soap Wort. Matheson, DeForest, Hicks, Havemeyer, Country Life Press.

Saponaria officinalis L. Bouncing Bet. Hodenpyl.

Saponaria Vaccaria L. Cow Herb. Havemeyer.

Silene acaulis L. Moss Campion. Hicks, Country Life Press.

Silene alpestris Jacq. Alpine Catchfly. Hodenpyl, Havemeyer.

Silene Armeria L. Sweet William Catchfly. Havemeyer.

Silene orientalis Hort. (S. *compacta* Fisch.) Oriental Catchfly. Bailey, DeForest.

Silene pennsylvanica Michx. Peat Pink. DeForest, Hodenpyl.

Silene Schafta G. Gmel. Schafta Catchfly. DeForest, Country Life Press.

Stellaria Holostea L. Easter Bells. Havemeyer.

Tunica Saxifraga Scop. Saxifrage Tunic Flower. Hodenpyl, Hicks, Havemeyer, Country Life Press.

ORDER XVIII. RANALES (RANUNCULALES).

NYMPHAEACEAE.

Nelumbo nucifera Gaertn. (*N. Nelumbo*, Druce.) Hindu Lotus. Hodenpyl. Var. *albagrandi* Hort., *flora* Hort., *kermesiana* Hort., *pekinensis* Hort. Hodenpyl.

Nymphaea alba L. var. *candidissima* Hort. Large European Water Lily. Bailey, Hodenpyl.

Nymphaea gracilis Hort. White Mexican Water Lily. Hodenpyl.

Nymphaea Lotus Zucc. L. White Egyptian Lotus. Tiffany.

Nymphaea odorata Ait. American Water Lily. Hodenpyl.

Nymphaea tuberosa Paine. Magnolia Water Lily. Hodenpyl. Var. *Richardsoni* Conard. Hodenpyl.

Nymphaea-horticultural varieties: Flesh Marliac (*Marliacea carnea* Hort.), Hodenpyl. Gladstone (*Gladstoniana* Hort.), DeForest. "James Bryden," DeForest, Hodenpyl, Marliac (*Marliacea* Hort.), DeForest, Hodenpyl. Red Magnolia (*tuberosa*), Hodenpyl. Robinson (*robinsoni* Hort.), Hodenpyl. Rose Magnolia (*tuberosa rosea* Hort.), Hodenpyl. White Marliac (*Marliacea albida* Hort.), Hodenpyl. William Dooque, Hodenpyl. Yellow Marliac (*Marliacea chromatella* Hort.), Hodenpyl.

TROCHODENDRACEAE.

Cercidiphyllum japonicum Sieb. Zucc. Katsura-tree. Hicks, Havemeyer. Var. *sinensis* Hort.; Chinese Katsura Tree. Hodenpyl.

RANUNCULACEAE.

Aconitum autumnale Reichb. Autumn Monkshood. DeForest.

Aconitum Fischeri Reichb. Azure Monkshood. DeForest. Var. *Wilsonii* Davis. Violet Monkshood. DeForest, Havemeyer, Country Life Press.

Aconitum Napellus L. Aconite. DeForest, Matheson, Hicks, Hodenpyl, Country Life Press.

Actaea alba (Ait.) Willd. White Baneberry. Matheson, Hodenpyl.

Actaea rubra (Ait.) Willd. Red Baneberry. Hodenpyl.

Adonis vernalis L. Spring Adonis. DeForest, Hodenpyl, Pratt.

Anemone canadensis L. Meadow Anemone. Matheson, DeForest, Hodenpyl.

Anemone fulgens Gay. Scarlet Anemone. Hodenpyl.

Anemone hupehensis Hort. Bailey.

Anemone japonica Sieb. & Zucc. Japanese Anemone.

Anemone patens L. var. *Nuttalliana* Gray. American Pasque Flower. Hodenpyl.

Anemone Pulsatilla L. European Pasque Flower. Hodenpyl, Havemeyer. Var. *rubra* Hort. Country Life Press.

Anemone sylvestris L. Snowdrop Anemone. Hodenpyl.

Anemonella thalictroides (L.) Spach. Hodenpyl.

Aquileqia caerulea James. Colorado Columbine. Havemeyer, Matheson, Kahn, DeForest, Hodenpyl, Bailey, Hicks, Pratt.

Aquilegia canadensis L. American Columbine. Kahn, DeForest, Hodenpyl, Tiffany, Hicks, Havemeyer.

Aquilegia chrysantha Gray. Golden Columbine. Matheson, DeForest, Hodenpyl, Hicks, Havemeyer.

Aquilegia flabellata Sieb. & Zucc. Fan Columbine. DeForest. Var. *nana alba* Hort. White Fan Columbine. DeForest.

Aquilegia vulgaris L. European Columbine. Hicks, Havemeyer.

Caltha minor Hort. Hodenpyl.

Caltha palustris L. Marsh marigold. Hodenpyl.

Caltha polypetala Hochst. Great Marsh-marigold. Hodenpyl.

Cimicifuga davurica Maxim. Dahurican Bugbane. Matheson.

Cimicifuga foetida Linn. Var. *Simplex* Reg. Bailey, DeForest, Havemeyer, Pratt.

Cimicifuga japonica Spreng. Bugbane. DeForest.

Cimicifuga racemosa Nutt. Black Snakeroot. DeForest, Pratt, Hodenpyl, Bailey, Hicks.

Cimicifuga simplex Wormsk. Japan Snake Root. Country Life Press.

Clematis crispa L. Curly Clematis. Havemeyer.

Clematis dioscoreifolia Hort. Yamleaf Clematis. Hodenpyl.
Clematis Fremonti Wats. Fremont Clematis. Hodenpyl.
Clematis fusca Turcz. var. *mandschurica* Hort. Hodenpyl.
Clematis heracleaefolia DC. var. *Davidiana* Hemsl. Fragrant Tube Clematis. Bailey. Var. *stans* Hoch, Hodenpyl.
Clematis Jackmani Moore. Pratt, DeForest, Matheson, Hodenpyl, Hicks, Havemeyer. Country Life Press.
Clematis Lawsoniana Anderson, var. *Henryi* Rehd. Country Life Press.
Clematis montana Buch. Ham. Anemone Clematis. DeForest, Hodenpyl, Bailey, Havemeyer.
Clematis orientalis Lam. Yellow clematis. oCuntry Life Press.
Clematis paniculata Thunb. Sweet Autumn Clematis. Tiffany, Matheson, DeForest, Hodenpyl, Hicks, Havemeyer.
Clematis recta L. Ground Clematis. DeForest, Hodenpyl, Havemeyer, Pratt, Country Life Press.
Clematis serratifolia Rehd. Korean Clematis. Hodenpyl.
Clematis tangutica Kershinsky. Golden Clematis. Hodenpyl, Country Life Press.
Clematis texensis Buckl. Scarlet Clematis. Bailey.
Clematis virginiana L. Virgin's Bower. Hodenpyl, Fish Hatchery, C. S. H. Bailey, Hicks.
Coptis trifolia (L.) Salisb. Gold Thread. Hodenpyl.
Delphinium cultorum Voss. Pale blue larkspur. Country Life Press.
Delphinium formosum Boiss and Huet. Hardy larkspur. Bailey, Tiffany, Willys, DeForest, Hicks.
Delphinium grandiflorum L. Siberian Larkspur. DeForest, Hodenpyl, Hicks, Havemeyer, Pratt. Var. *Chinense* Huth. (Slenderlarkspur), Tiffany, Kahn ,DeForest.
Delphinium hybridum Steph. Mountain Larkspur. Matheson.
Delphinium nudicaule Torr. and Gray. Red Larkspur. Hodenpyl.
Delphinium Horticultural varieties:

Belladonna Tiffany, Kahn, DeForest, Willys.
King of Delphiniums. Hodenpyl.

Lamartine. Kahn.
Persimmon. Hodenpyl.
White Siberian. Matheson, Willys.
Sir George Newnes. Hodenpyl.
Beauty of Langport. Hodenpyl.

Eranthis hyemalis Salisb. Winter Aconite. Hodenpyl.
Helleborus niger L. Christmas Rose. Hodenpyl, Havemeyer.
Hepatica acutiloba DC. Sharplobe Hepatica. DeForest, Hodenpyl.
Hepatica triloba Chaix. Round lobe Hepatica. DeForest, Hodenpyl, Hicks.
Hydrastis canadensis L. Goldenseal. Hodenpyl.
Nigella damascena L. Love-in-a-mist. Davenport garden, C. S. H., Bailey.
Nigella hispanica L. Havemeyer.
Paeonia alibiflora Pallas. Chinese Peony. Havemeyer.
Paeonia officinalis L. Common Peony. Willys, Havemeyer.
Paeonia suffruticosa Andr. Tree Peony. Hicks, Bailey, Havemeyer.
Paeonia—horticultural varieties:

Duchesse de Nemours (Gue) Matheson.
Edulis superba (Lemon) Matheson.
Eugene Verdier (Cal.) Matheson.
Festiva Maxima (Miel) Matheson, Kahn.
Floral Treasure (Ros.) Matheson.
Humei Carnea (Gue.) Matheson.
Jeanne d'Arc (Gal.) Matheson.
La Tulipe (Cal.) Matheson.
Lady Leonora Bramwell (Verd.) Matheson.
Mme. Geissler (Cr.) Matheson.
Mme. Jules Elie (Cal.) Matheson.
Mme. Le Moine (Cal.) Matheson.
Modeste Guerin (Gue.) Matheson.
Mons Jules Elie (Cr.) Matheson.

Ranunculus aconitifolius L. Aconite Buttercup. DeForest, Hodenpyl.
Ranunculus asiaticus L. Turbin. Hodenpyl.
Ranunculus fascicularis Muhl. Tufted Buttercup. Hodenpyl.

Ranunculus repens L. Creeping Buttercup. Tiffany, DeForest, Hodenpyl.

Ranunculus septentrionalis Poir. Swamp Buttercup. Hodenpyl.

Syndesmon thalictroides Hoffman. Hodenpyl.

Thalictrum aquilegiflorum L. Columbine Meadow Rue. Matheson, DeForest, Hodenpyl, Havemeyer.

Thalictrum dasycarpum Fisch. and Lall. Purple Meadow Rue. Bailey.

Thalictrum dioicum L. Early Meadow Rue. Hodenpyl.

Thalictrum dipterocarpum Franch. Meadow Rue. Havemeyer, Pratt, DeForest, Country Life Press, Bailey.

Thalictrum glaucum Desf. Dutsy-Meadow Rue. Hodenpyl, Havemeyer.

Thalictrum horticultural varieties:

(*Thalictrum sulfureum* Cy.) Hybrid Meadow Rue. Hodenpyl.

Maidenhair Meadow Rue (*T. minus* L. × *adiantifolium* Hort.) Bailey, Tiffany, Matheson, Hicks, DeForest.

Purple Columbine Meadow Rue (*T. aquilegifolium* L. × *purpureum* Hort.) DeForest, Hodenpyl.

White Columbine Meadow Rue (*T. aquilegifolium* L. × *album* Hort.) DeForest.

Trollius aurantiacus Hort. Hodenpyl.

Trollius asiaticus L. Hodenpyl, Pratt.

Trollius caucasicus Stev. Caucasian Globe flower. Hodenpyl, Bailey.

Trollius europaeus L. Common Globeflower. Matheson, Hodenpyl, Havemeyer, Pratt.

Trollius giganteus Hort. Hodenpyl.

Trollius japonicus Hort. Japanese Globeflower. Hodenpyl (*T. Asiaticus.* L.?)

Zanthorhiza apiifolia L. Her. Shrub Yellowroot. DeForest, Hodenpyl, Bailey.

LARDIZABALACEAE.

Akebia quinata Decne. Five leaf Akebia. DeForest, Pratt, Matheson, Bailey, Hodenpyl, Hicks, Havemeyer.

Decaisnea Fargesii Franch. Hodenpyl.

MENISPERMACEAE.

Asimina triloba Dunal. Papaw. Hodenpyl, Hicks.
Menispermum Dauricum DC. Asiatic Moonseed. Hodenpyl.

BERBERIDACEAE.

Berberis actinacantha Mart. Hodenpyl.
Berberis aggregata Schneid var. *Pratti* Hort. Barberry. Bailey, Hodenpyl. Var. *recurvata* Hort. Hodenpyl.
Berberis Amurensis Rupr. Amur Barberry. Bailey, Hodenpyl.
Berberis asiatica Roxb. Hodenpyl. Var. *japonica* Rehd. Hakodate Barberry. Hodenpyl, Bailey.
Berberis brachypoda Hort. Hodenpyl.
Berberis brevipaniculata Schneid. Shortcluster Barberry. Bailey, Havemeyer.
Berberis buxifolia Poir. Magellan Barberry. Bailey.
Berberis canadensis Mill. Allegheny Barberry. Bailey.
Berberis circumserrulata Hort. Hodenpyl.
Berberis Darwini Hook. Darwin Barberry. Bailey, Havemeyer.
Berberis diaphana Max. Kansu Barberry. Hodenpyl, Bailey, Hicks.
Berberis dictyophylla Franch. Chalkleaf Barberry. Bailey.
Berberis Gagnepaini Schneid. Black Barberry. Bailey, Hodenpyl, Hicks, Havemeyer.
Berberis Gilgiana Hort. Hodenpyl.
Berberis ilicifolia Forst. Holly Barberry. Bailey, Hodenpyl, Matheson.
Berberis Julianae Schneid. Wintergreen Barberry. Bailey, Hodenpyl, Havemeyer.
Berberis Morrisonensis Hort. Hodenpyl.
Berberis Neuberti Lem. var. *latifolia* Hort. Broadleaf Barberry. Bailey.
Berberis notabilis Hort. Hodenpyl.
Berberis Poireti Schneid. Poiret Barberry. Hodenpyl.
Berberis Sargentiana Schneid. Sargent Barberry. Bailey, Hodenpyl, Hicks, Havemeyer.

Berberis reflecta Hort. Hodenpyl.
Berberis sinensis Desf. Chinese Barberry. Bailey.
Berberis stenophylla Mast. Rosemary-Barberry. Bailey, Havemeyer.
Berberis Thunbergi DC. Japanese Barberry. Bailey, Tiffany, Matheson, Havemeyer, Pratt. Var: *Maximowiczi* Franch and Sav. Coral Barberry. Bailey. Var: *minor* Cy. Bix Barberry. Bailey.
Berberis triacanthophora Hort. Three spine Barberry. Hodenpyl.
Berberis Vernae Schneid. Verna Barberry. Bailey, Hodenpyl.
Berberis verruculosa Hemsl. & Wils. Warty Barberry. Bailey, Hodenpyl, DeForest, Hicks, Havemeyer.
Berberis vulgaris L. European Barberry. Matheson, Bailey, Hicks, Havemeyer. Var: *atropurpurea* Regl. Purple Barberry. Tiffany, Matheson, Bailey.
Berberis Wilsonae Hemsl. Wilson Barberry. Bailey, Hodenpyl, DeForest, Hicks, Havemeyer.
Caulophyllum thalictroides (L.) Michx. Blue Cohosh. Hodenpyl.
Epimedium alpinum Hook? Alpine Epimedium. DeForest, Hodenpyl.
Epimedium macranthum Morr. & Decne. Longspur Epimedium. DeForest.
Epimedium Musschianum Morr. & Decne. Japanese Epimedium. Hodenpyl.
Epimedium pinnatum Fisch. Hodenpyl.
Mahonia Aquifolium Nutt. Oregon Hollygrape. Havemeyer, Matheson, Bailey, Tiffany, DeForest, Hicks, Pratt, Country Life Press.
Mahonia Bealii Fort. (B. *Japonica* Spreng.) Leatherleaf Hollygrape. Havemeyer, Matheson, DeForest, Hodenpyl, Bailey.
Mahonia repens Lindl. Creeping Holly Grape. Havemeyer.
Podophyllum peltatum L. Common May Apple. Hodenpyl.
Vancouveria hexandra Morr. and Decne. Hodenpyl.

MAGNOLIACEAE.

Liriodendron tulipifera L. Tulip-tree. Bailey, Matheson, DeForest, Hodenpyl, Hicks, Willys.

Magnolia acuminata L. Cucumber Tree. Bailey, Davenport, Willys, Hodenpyl, Hicks, Havemeyer, Dana Island.

Magnolia (*conspicua*) *Yulan* Desf. Bailey, DeForest, Hodenpyl, Hicks.

Magnolia Fraseri Walt. Fraser Magnolia. Bailey, Hodenpyl.

Magnolia glauca L. (*Virginiana* L.) Sweet Bay. Bailey, Hodenpyl, Hicks, DeForest, Country Life Press.

Magnolia grandiflora L. Bailey, Hodenpyl, Havemeyer, Dana Island, DeForest.

Magnolia hypoleuca Sieb. & Zucc. Silver Magnolia. Bailey, Hicks, Havemeyer, Dana Island.

Magnolia Kobus Thunb. Kobus Magnolia. Bailey, Havemeyer.

Magnolia macrophylla Mchx. Great Leaved Magnolia. Tiffany. Hicks, DeForest, Havemeyer, Dana Island.

Magnolia parviflora Sieb. & Zucc. Oyama Magnolia. DeForest, Hodenpyl, Bailey.

Magnolia salicifolia Ait. (*M. grandiflora* L) Anise Magnolia. Hodenpyl.

Magnolia Soulangeana Soul. Saucer Magnolia. Matheson, Pratt, Havemeyer, DeForest, Hodenpyl, Bailey, Davenport; var. *speciosa* Hort. (striped saucer magnolia) Hodenpyl; var. *Alexandrian* Hort. (Alexander Magnolia) Hodenpyl; *Lennei* (Lenne Magnolia) Hort. Tiffany, Hodenpyl.

Magnolia stellata Maxim. Star Magnolia. DeForest, Hodenpyl, Hicks, Bailey, Havemeyer, Pratt; var. *stellata rosea* Hort. Pink Star Magnolia. Hodenpyl.

Magnolia Thompsonia Sarg. Thompson Magnolia. Bailey.

Magnolia tripetala L. Umbrella Tree. DeForest, Hodenpyl, Hicks, Bailey, Havemeyer, Dana Island.

Magnolia Watsoni Hook. Watson Magnolia. DeForest, Hodenpyl, Bailey.

Magnolia Wilsoni Hort. Wilson Magnolia. Bailey.

CALYCANTHACEAE

Calycanthus floridus L. Common Sweetshrub. Matheson, Hodenpyl, Hicks.

LAURACEAE.

Benzoin aestivale L. Nees. Spice bush. Matheson, Hodenpyl, Hicks.

Sassafras variifolium Kuntze. Sassafras. Matheson, Bailey, Tiffany, Willys, Hicks.

ORDER XIX. RHOEADALES (PAPAVERALES).

PAPAVERACEAE.

Argemone grandiflora Sweet. Prickle poppy. Bailey.

Bocconia cordata Willd. Pink Plume Poppy. Tiffany, Matheson, DeForest.

Eschscholzia californica Cham. Common California Poppy. Bailey, Tiffany.

Hunnemannia fumariaefolia Sweet. Goldencup or Mexican Tulip Poppy. Bailey.

Meconopsis cambrica Vig. Welsh Poppy. DeForest, Bailey.

Meconopsis Wallichi Hort. Satin Poppy. Bailey.

Papaver bracteatum Lindl. Great Scarlet Poppy. Tiffany, Matheson.

Papaver nudicaule L. Island Poppy. Hicks, Havemeyer, Country Life Press.

Papaver orientale L. Oriental Poppy. Bailey, Tiffany, Hodenpyl, Matheson, Hicks, Havemeyer.

Papaver somniferum L. Opium Poppy. Gardens, C. S. H.

Romneya Coulteri Harv. Coulter Canyon Poppy. DeForest.

Sanguinaria canadensis L. Bloodroot. DeForest, Hodenpyl, Bailey, Hicks.

FUMARIACEAE.

Dicentra canadensis Walp. Squirrelcorn. Hodenpyl.

Dicentra Cucullaria Bern. Dutchman's Breeches. DeForest, Hodenpyl.

Dicentra eximia Torr. Fringed Bleeding heart. Hodenpyl, DeForest, Hicks.

Dicentra formosa Walp. Western Bleeding heart. Hodenpyl.
Dicentra spectabilis Lem. Bleeding heart. Matheson, DeForest, Hodenpyl, Hicks, Havemeyer.

CRUCIFERAE.

Aethionema grandiflorum Boiss and Hohen. Persian Candy Tuft, Country Life Press.
Aethionema pulchellum Hort. Armenian Candy Tuft. Country Life Press.
Aethionema iberidium Hort. Oriental Candy Tuft. Country Life Press.
Alyssum argenteum Vitm. Silver Alyssum. DeForest, Hodenpyl, Tiffany, Country Life Press.
Alyssum maritimum Lam. (*maritima* Desv.) Sweet Alyssum. Kahn, Bailey; var. "Little Gem," Willys, Tiffany.
Alyssum rostratum Stev. Yellow Head. DeForest, Hodenpyl, Matheson est.
Alyssum saxatile L. Golden-Tuft. DeForest, Kahn, Matheson, Hodenpyl, Tiffany, Bailey, Hicks, Havemeyer, Country Life Press. Var: *compactum* Hort. Dwarf Golden-Tuft. DeForest, Hodenpyl.
Arabis albida Stev. Wallcress. Havemeyer. Var: *flore pleno* Hort. Country Life Press.
Arabis alpina L. Alpine Rockcress. Matheson, DeForest, Hodenpyl, Tiffany, Hicks, Havemeyer. Var: *nana compacta* Hort. Dwarf Alpine Rockcress. DeForest, Hodenpyl.
Arabis mollis Stev. Downy Rockcress. Hodenpyl, Country Life Press.
Arabis muralis Bert. Italian Rock Cress. DeForest.
Arabis rosea Hort. Country Life Press.
Armoracia rusticana Gaertn. Mey & Scherb. Horse Radish, C. S. H. vicinity.
Aubrietia deltoidea DC. Havemeyer, Country Life Press. Var: *graeca* Nichols. Greek Aubrietia. *Leichtlini* Nichols. Leichtlin A. Country Life Press. Var. *Moerheimi* Cy. Moerheim A. DeForest.
Brassica Napobrassica Hort. Rutabaga. C. S. H.

Brassica oleracea var. *capitata* L. Cabbage. Gardens C. S. H.
Brassica Rapa L. Turnip. Gardens C. S. H.
Cheiranthus allioni Hort. Wallflower. Matheson, DeForest, Hodenpyl, Bailey, Tiffany.
Cheiranthus Cheiri L. Common Wallflower. Matheson, Bailey, Havemeyer, Pratt.
Dentaria diphylla Michx. Crinkleroot. Hodenpyl.
Dentaria laciniata Muhl. Cut Tooth wort. Hodenpyl.
Draba Fladnizensis Wulf. Havemeyer, Country Life Press.
Draba olympica Sibth. Whitlow Grass. Havemeyer.
Erysimum Perofskianum Fisch & Mey. African Blistercress. Havemeyer.
Erysimum pulchellum J. Gay (*E. rupestre* D. C.) Rockery Bittercress. Hodenpyl, Country Life Press.
Hesperis Matronalis L. Dames Violet. Matheson, DeForest, Escaped, C. S. H., Hodenpyl.
Hutchinsia alpina Hort. Country Life Press.
Iberis gibraltarica L. Gibraltar or Perennial Candy tuft. Matheson, Bailey, Havemeyer, Country Life Press.
Iberis sempervirens L. Evergreen Candy tuft. Kahn, DeForest, Hodenpyl, Hicks, Bailey, Havemeyer, Pratt, Country Life Press; var. *"Little Gem"* Country Life Press.
Matthiola incana R. Br. Stock or Gilliflower. Cultivated, C. S. H. vicinity.
Radicula nasturtium-aquaticum L. Britten & Rendle. Watercress. Hodenpyl.
Raphanus sativus L. Radish. Cultivated in gardens. C. S. H.

RESEDACEAE.

Reseda odorata L. Common Mignonette. Country Life Press, Tiffany, Matheson, Pratt.

ORDER XX. SARRACENIALES.

SARRACENIACEAE.

Sarracenia Drummondi Croom. Drummond Pitcher Plant. Hodenpyl.

Sarracenia flava L. Pitcher Plant. Hodenpyl; var. *picta* Bull (*S. catesbaei* Ell.) Catesby pitcher plant. Hodenpyl.
Sarracenia psittacina Michx. Parrot Pitcher Plant. Hodenpyl.
Sarracenia purpurea L. Common Pitcher Plant. Hodenpyl.
Sarracenia rubra Watt. Sweet Pitcher Plant. Hodenpyl; var. *Sweetii* Mast. Hooded Pitcher Plant. Hodenpyl.

DROSERACEAE.

Dionaea muscipula Ellis. Venus Flytrap. Hodenpyl.
Drosera rotundifolia L. Roundleaf Sundew. Hodenpyl.

ORDER XXI. ROSALES.

CRASSULACEAE.

Echeveria secunda Booth. Tiffany, Havemeyer.
Sedum acre L. Goldmoss. Matheson, DeForest, Hodenpyl, Tiffany, Hicks, Bailey, Havemeyer.
Sedum Aizoon L. Aizoon Stonecrop. Havemeyer.
Sedum album L. White Sedum. DeForest, Hodenpyl, Hicks, Bailey, Country Life Press.
Sedum anglicum Huds. Havemeyer.
Sedum caeruleum Vehl. Blue Sedum. Bailey.
Sedum dasyphyllum L. Leafy Stonecrop. Havemeyer, Country Life Press.
Sedum kamtschaticum Fisch and Mey. Orange Sedum. Bailey, Tiffany, DeForest, Hodenpyl, Hicks.
Sedum lydium Boiss. Lydian Sedum. DeForest.
Sedum pulchellum Michx. Texas Stonecrop. Havemeyer, Country Life Press.
Sedum reflexum L. Jenny Stonecrop. Hodenpyl.
Sedum rupestre L. Havemeyer.
Sedum sempervivoides Fisch. False Houseleck. Havemeyer.
Sedum sexangulare L. Hexagon Stonecrop. DeForest, Hodenpyl, Country Life Press.
Sedum Sieboldii Sweet. Siebold Sedum. Bailey, Matheson, DeForest, Hicks, Havemeyer, Country Life Press.

Sedum spectabile Boreau. Showy Sedum. DeForest, Tiffany, Hodenpyl, Hicks, Havemeyer, Pratt, Country Life Press.
Sedum stoloniferum Gmel. Running Sedum. DeForest, Bailey, Hodenpyl, Hicks, Havemeyer. Var: *spurium* Hort. Country Life Press.
Sedum telephoides Michx. Wild Live-Forever. Hodenpyl.
Sedum ternatum Michx. Mountain Stonecrop. Hodenpyl, Country Life Press.
Sempervivum arachnoidum L. Spider Web Houseleek. DeForest, Country Life Press.
Sempervivum arvernense Lecq. & Lam. Havemeyer.
Sempervivum soboliferum Sims. Hen-and-Chickens. Matheson.
Sempervivum tectorum L. Common Houseleek. DeForest, Hicks, Havemeyer, Country Life Press.

SAXIFRAGACEAE.

Astilbe astilboides Lemoine. Goastbeard Astilbe. Hodenpyl Matheson, Bailey, Havemeyer.
Astilbe chinensis Franch and Say. Chinese Astilbe. Hicks.
Astilbe Davidii Henry. David Astilbe. Bailey, Hodenpyl, DeForest, Havemeyer, Pratt.
Astilbe gloria Hort. Hodenpyl.
Astilbe koreana Hort. Hodenpyl.
Astilbe grandis Stapf. Var. *rosea* Hort. Country Life Press.
Astilbe japonica Gray. Japanese Astilbe. DeForest, Hodenpyl, Hicks, Havemeyer.
Astilbe rosea Von Wareren and Kruijft. Rose Astilbe. Bailey, Tiffany, DeForest, Hicks.
Astilbe vars. *Peach Blossom* Matheson, *Queen Alexandra* Hodenpyl, *W. E. Gladstone*, Matheson, DeForest.
Carpenteria californica Torr. Havemeyer.
Deutzia discolor Hemsl. Bailey.
Deutzia glabrata Hort. Hodenpyl.
Deutzia gracilis Sieb. & Zucc. Slender Deutzia. Bailey, Tiffany, Willys, Matheson, DeForest, Hicks, Havemeyer, Pratt.
Deutzia parviflora Bunge. Mongolian Deutzia. DeForest.

Deutzia scabra Thunb. Fuzzy Deutzia, Hicks. Var: *crenata* Voss, Bailey, Matheson, DeForest, Hodenpyl. Var. "Pride of Rochester," Bailey.

Deutzia setchuensis French. Szechwan Deutzia. Bailey.

Deutzia-horticultural vars: *Avalanche*, Bailey; *Boule de Neiga* Bailey; *Lemoinei* Cy., Bailey, Tiffany, Matheson, DeForest, Hodenpyl, Hicks.

Heuchera americana L. American Alumroot. Hodenpyl.

Heuchera bracteata Ser. Hodenpyl.

Heuchera brizoides Hort. Country Life Press.

Heuchera sanguinea Engelm. Coral bells. Havemeyer, Matheson, DeForest, Hodenpyl, Hicks, Bailey, Pratt. Var: *gracillima* Hort. (Grass leaf Coral Bells.) Hodenpyl.

Heuchera villosa Michx. Hairy Alumroot. Hodenpyl.

Hydrangea arborescens L. Bailey, Matheson, Hicks, DeForest, Hodenpyl, Pratt, Havemeyer. Var: *grandiflora* Rehd. (Snowhill Hydrangea), Matheson.

Hydrangea Bretschneideri Dipp. Shaggy Hydrangea. Hodenpyl.

Hydrangea cinerea Small. (*H. radiata* Walt.) Ashy Hydrangea. Hodenpyl.

Hydrangea opuloides Koch. Havemeyer. Var: *otaksa*, Sieb and Zucc. Dtaksa Hydrangea. Tiffany, Bailey, Willys. Var: "*General de Vibraye*." Matheson.

Hydrangea paniculata Sieb. Panicle Hydrangea. Tiffany, Matheson, DeForest, Hodenpyl, Willys, Hicks, Bailey, Havemeyer, Pratt.

Hydrangea petiolaris Sieb. & Zucc. Climbing Hydrangea. Hodenpyl, DeForest, Bailey, Hicks, Dana Island (Pratt).

Hydrangea quercifolia Bartram. Oakleaf Hydrangea, Hodenpyl, DeForest, Bailey, Hicks, Dana Island (Pratt).

Hydrangea radiata Walt. Silverleaf Hydrangea, Hodenpyl.

Hydrangea xanthoneura Diels. Yellow vein Hydrangea, DeForest. Var: *Wilsoni* (Wilson Hydrangea), Hodenpyl.

Itea virginica L. Sweetspire. Hodenpyl, Havemeyer.

Jamesia Americana Tarr and Gr. Japanese Anemone. Hodenpyl.

Mitella diphylla L. Common Bishop's cap. DeForest, Hodenpyl.
Parnassia asarifolia Vent. Brook Parnassia. Hodenpyl.
Parnassia caroliniana Michx. Carolina Parnassia. Hodenpyl.
Philadelphus coronarius L. Sweet Mock-orange. Matheson, DeForest, Hodenpyl, Bailey.
Philadelphus cymosus Rehd. Havemeyer.
Philadelphus Falconeri Sarg. Star Mock-orange. Bailey.
Philadelphus Gordonianus Lindl. Gordon Mock-orange. Hodenpyl, Bailey.
Philadelphus grandiflorus Willd. (P. *inodoratus*, var. *grandiflorus*, Gray.) Big Scentless Mock-orange. Matheson, Hodenpyl, Hicks.
Philadelphus inodorus L. Scentless Mock-orange. Matheson, Hodenpyl, Pratt.
Philadelphus Lewisi Pursh. Lewis Mock-orange. Hodenpyl.
Philadelphus magdalenae Hort. Magdalena Mock-orange. Hodenpyl.
Philadelphus purpurascens Hort. Purplecup Mock-orange. Bailey, Hodenpyl.
Philadelphia virginalis Rehd. Havemeyer.
Philadelphus Wilsoni Hort. Wilson Mock-orange. Hodenpyl.
Philadelphus Lemoinei Lemoine. Hodenpyl, Hicks, Havemeyer, Pratt. Vars: *Avalanche*, Bailey, Hicks; *Boule l' Argent*, Bailey; *Candelabre*, Bailey, Jack (P. *Schrenki jacki* Hort.) Hodenpyl; *Mont Blanc*, Hicks; *Perle Blanche*, Bailey; *Splendens* (?), Hodenpyl; *Virginal* (?), Bailey, Hodenpyl, Hicks: *Voie Lactee* (?), Bailey.
Philadelphus zeyheri Schrad. Hodenpyl.
Ribes alpinum L. Mountain Currant. Hodenpyl.
Ribes aureum Pursh. Slender Golden Currant. Hodenpyl.
Ribes gordonianum Lem. (*aureum* & *sanguineum*) Gordon Currant. Hodenpyl.
Ribes mescalerium Hort. Hodenpyl.
Ribes odoratum Wendl. Golden Currant. Havemeyer.
Ribes oxycanthoides L. Hodenpyl.
Ribes sanguineum Pursh. Winter Currant. Tiffany, Willys, Hodenpyl.

Ribes vulgare Lam. (*Sativum* Syme) Common Currant. Havemeyer.

Rodgersia podophylla Gray. Bronze leaf. Hodenpyl.

Saxifraga Aizoon Jacq. DeForest, Havemeyer.

Saxifraga arguta Hort. Hodenpyl.

Saxifraga cordata Hort. Hodenpyl.

Saxifraga cordifolia Haw. Heartleaf Saxifrage. Matheson, DeForest, Hodenpyl; var. *purpurea* Hort; *compactum* Hort; *splendens* Hort; *Amos Perry* Hort, Country Life Press.

Saxifraga crassifolia Linn. Leather Saxifrage. Tiffany, DeForest, Hicks. Var: *orbicularis* (Dwarf Leather Saxifrage) Hort. Hodenpyl. *Van Houttei* Hort. Saxifrage. Hodenpyl.

Saxifraga lingulata Bell. Rajah Saxifrage. Hodenpyl, Havemeyer.

Saxifraga sarmentosa L. Strawberry Saxifrage. Havemeyer.

Saxifraga squarrosa Sieber. Crevice Saxifrage. Hodenpyl.

Saxifraga umbrosa L. London-Pride Saxifrage. DeForest, Hodenpyl, Havemeyer.

Saxifraga virginiensis Michx. Virginia Saxifrage. Hodenpyl.

Schizophragnia hydrangeoides Sieb. & Zucc. Japanese Hydrangea Vine. Bailey, Hicks, Havemeyer, Pratt.

Schizophragma integrifolium Oliver. Chinese Hydrangea vine. Matheson.

Tiarella cordifolia Hort. Foam Flower. Country Life Press. Var. *purpurea major*. Red Foam Flower. Country Life Press.

PITTOSPORACEAE.

Pittosporum phillyraeoides DC. Narrow-leaved Pittosporum. Havemeyer.

HAMAMELIDACEAE.

Corylopsis gotoana Hort. Goto. Winterhazel. Bailey, Hodenpyl.

Corylopsis pauciflora Hort. Flowering Hazel. Country Life Press.

Corylopsis spicata Sieb. & Zucc. Spike Winterhazel. Bailey, Hodenpyl.

Fothergilla major Lodd. Large Fothergilla. Hodenpyl.

Hamamelis japonica Sieb. & Zucc. Japanese Witch Hazel. DeForest, Hodenpyl, Hicks, Bailey.

Hamamelis mollis Oliver. Chinese Witch Hazel. Hicks.

Hamamelis vernalis Sarg. Hodenpyl, Hicks.

Hamamelis virginiana L. Witch Hazel. Hodenpyl, Hicks, Bailey, Dana Island, Havemeyer.

Liquidambar formosana Hance. Formosa sweetgum. Hicks.

Liquidambar Styraciflua L. Sweet Gum. Bailey, Willys, DeForest, Tiffany, Hodenpyl, Hicks, Pratt, Havemeyer.

Parrottia persica C. A. Mey. Russian Parrottia. Bailey, Hicks.

PLATANACEAE.

Platanus acerifolia Willd. London Plane. Kahn.

Platanus occidentalis L. American Plane Tree. Bailey, Willys, Matheson, Fish Hatchery, C. S. H., Hodenpyl, Hicks, Havemeyer, Pratt.

Platanus orientalis L. European Plane Tree. Bailey, Willys, Matheson, Hodenpyl, Hicks.

ROSACEAE.

Amelanchier alnifolia Nutt. Saskatoon. Matheson, Bailey, Havemeyer.

Amelanchier canadensis L. Medic Downy Serviceberry. DeForest, Hodenpyl, Bailey, Hicks.

Amelanchier ovalis Medikus. Garden Shadblow. Hodenpyl.

Amelanchier stolonifera Wiegand. Running Shadblow. Hicks.

Amygdalus Davidiana Franch. Chinese Wild Peach. Bailey.

Amygdalus Persica L. (*Prunus persica*. Sieb. & Zucc.) Peach. Hicks, Hodenpyl, Matheson, DeForest, Escaped C. S. H. Havemeyer; var. *alboplena* Hort. Double White Peach. Bailey; var. *nectarina* Hort. Nectarine. Hodenpyl, Matheson, Hicks; var. *rubro plena* Hort. Double Red Peach. Bailey.

Aronia arbutifolia L. Red chokeberry. Matheson, Hicks, Hodenpyl, Bailey, Havemeyer.

Aronia atropurpurea Hort. (*A. floribunda* Ag.) Purple Chokeberry. Bailey, Hicks.

Aronia melanocarpa Spach. Black chokeberry. Hodenpyl, Bailey, Hicks.

Aruncus Sylvester Kostl. Common Goatsbeard. Kahn, Hodenpyl, Havemeyer, Pratt; var. *Kneiffi* Zabel. Cutleaf Goatsbeard. Hodenpyl.

Cotoneaster acutifolia Lindl. Peking Cotoneaster. Hodenpyl, Hicks, Bailey; var. *villosula* Hort. Hodenpyl.

Cotoneaster adpressa Hort. Creeping Cotoneaster. Tiffany, DeForest, Hodenpyl, Hicks, Bailey.

Cotoneaster apiculata Hort. Hodenpyl.

Cotoneaster bullata Hort. Hodenpyl.

Cotoneaster buxifolia Wall. Bailey.

Cotoneaster Dammerii Schneid. Hcdenpyl.

Cotoneaster Dielsiana Pritz. Diels Cotoneaster. Hodenpyl, Bailey, Hicks, Havemeyer.

Cotoneaster distochya Hort. (*distichia?*) Hodenpyl.

Cotoneaster divaricata Rehd. and Wils. Spreading Cotoneaster. Hodenpyl, Bailey, Hicks.

Cotoneaster Francheti Bois. Franchet Cotoneaster. DeForest, Hodenpyl, Bailey, Hicks.

Cotoneaster frigida Wall. Himalayan Coloneaster. Hodenpyl, Bailey.

Cotoneaster Harroviana Hort. Hodenpyl.

Cotoneaster Henryana Hort. Hodenpyl.

Cotoneaster horizontalis Decne. Rock Cotoneaster, Hicks, Bailey, Hodenpyl, DeForest, Havemeyer, Pratt; var: *Wilsoni*, Havemeyer, Hodenpyl, Hort; var: *humepusa* Hort, Havemeyer; var: *perpusilla* Hort, Hodenpyl; var: *himalaicus* Hort. Havemeyer.

Cotoneaster hupehensis Rehd. and Wilson. Hupeh Cotoneaster. Hodenpyl, Bailey, Hicks.

Cotoneaster integerrima Medic. European Cotoneaster. Hodenpyl.

Cotoneaster microphylla Wall. Rockspray, DeForest, Hodenpyl, Bailey, Hicks, Havemeyer, Country Life Press. Var: *thymifolia* Koehne, DeForest, Bailey.

Cotoneaster moupinensis Franch. Mupin Cotoneaster. Hodenpyl, Hicks, Bailey.
Contoneaster multiflora Bunge var. *colocarpa* Hort. Hodenpyl, Hicks.
Cotoneaster nitens Hort. Hicks.
Cotoneaster obscura Hort. Hodenpyl.
Cotoneaster praecox Hort. Hodenpyl.
Cotoneaster pyrenaica Hort. Pyrenees Cotoneaster. Bailey, DeForest.
Cotoneaster racemiflora Koch. Var. *soongarica* Schneid. Hodenpyl, Hicks.
Cotoneaster rotundifolia Wall. Roundleaf Cotoneaster. Bailey, Hodenpyl.
Cotoneaster salicifolia Franch. Willowleaf Cotoneaster. Hodenpyl, Hicks. Var: *floccosa* Hort., Hodenpyl.
Cotoneaster Simonsii Baker. Simon's Cotoneaster. Bailey, Hodenpyl, Hicks, Havemeyer.
Cotoneaster tenuipes Hort. Hodenpyl.
Cotoneaster Zabeli Schneid. Hodenpyl, Hicks.
Cotoneaster var. "Forest," Schneider, Hodenpyl.
Crataegus apiifolia Michx. Parsley Hawthorn. Bailey.
Crataegus arkansana Sarg. Arkansas Hawthorn. Bailey, Hodenpyl.
Crataegus Arnoldiana Sarg. Arnold Hawthorn. Bailey, Hodenpyl.
Crataegus Carrieri Vauv. Carriere Hawthorn. Bailey.
Crataegus coccinea L. Thicket Hawthorn. Hodenpyl.
Crataegus cordata Ait. Washington Hawthorn. Bailey, Hodenpyl, Hicks.
Crataegus Crusgalli L. Cockspur Thorn. Bailey, Hodenpyl, Matheson, DeForest, Hicks.
Crataegus Ellwangeriana Sarg. Ellwanger Hawthorn. Bailey, Hicks.
Crataegus fructuosa Hort. West Chester Hawthorn. Bailey.
Crataegus monogyna (Jacq.) var. *alba plena* Hort. Double English Hawthorn, DeForest, Hodenpyl. Var. *rubra plena* Hort. Double Red Hawthorn, DeForest.
Crataegus nitida Sarg. Glossy Hawthorn. Bailey, Hodenpyl.

Crataegus Oxyacantha L. English Hawthorn. Matheson, Kahn, DeForest, Hodenpyl, Bailey, Tiffany, Hicks, Pratt.

Crateagus pinnatifida Bunge. Chinese Hawthorn. Bailey, Hodenpyl.

Crataegus raphiolepsis Hort. Hodenpyl.

Cydonia Japonica Pers. (*Chaenomeles japonica* Lindl.) Flowering Quince. Bailey, Matheson, DeForest, Hodenpyl, Tiffany, Hicks.

Cydonia Maulei Nichols. Lesser Flowering Quince. Bailey; var *superba* Hort. (Ruby Flowering Quince), Bailey.

Cydonia oblonga Mill. Quince. C. S. H. village, Matheson, Hodenpyl, Bailey, Havemeyer.

Dalibarda repens L. DeForest, Hodenpyl.

Exochorda Giraldii Hesse, Havemeyer; var. (*Giraldii Wilsoni* Wilson) Pearlbush. Bailey, Hodenpyl.

Exochorda grandiflora Lindl. (*racemosa* Rehd.) Common Pearlbush. Matheson, DeForest, Hodenpyl, Hicks, Bailey.

Exochorda Korolkowi Lav. Hindustan Pearlbush. Havemeyer.

Filipendula Kamtschatica Rehd. Kamchatka Meadowsweet. Hodenpyl.

Filipendula hexapetala Gilib. (*Ulmaria filipendula* Hill) Dropwort. Hodenpyl.

Filipendula palmata Focke. Siberian Meadowsweet. Hodenpyl, DeForest.

Filipendula rubra Rob. Prairie Meadowsweet. DeForest; var. *venusta* Hort. (Carmine Meadowsweet), Matheson, Hodenpyl.

Fragaria vesca L. Strawberry. Jones Wood, C. S. H.

Geum chiloense Balb. Chloe Avens. Hodenpyl; var. "Mrs. Bradshaw," Bailey, Matheson, DeForest, Hodenpyl.

Gillenia stipulata Trel. Indian Physic. Hodenpyl.

Gillenia trifoliata Moench. Bowmans Root. Hodenpyl.

Holodiscus discolor Maxim. Rock spirea. Hodenpyl.

Kerria japonica DC. Kerria. Matheson, DeForest, Laboratory grounds, C. S. H., Hicks, Bailey, Hodenpyl, Havemeyer, Pratt; var. *florepleno* (Double *Kerria*), Matheson.

Malus angustifolia Michx. (*Pyrus angustifolia* Ait.) Southern Crab. Hodenpyl, Bailey.

Malus (*Pyris*) *Arnoldiana* Bailey. Bailey, Hodenpyl, Hicks, Havemeyer.

Malus (*Pyrus*) *atrosanguinea* Spaeth. Bailey, Matheson, Hodenpyl, Havemeyer.

Malus baccata Borkh. (*Pyrus baccata* L.) Siberian Crab. Tiffany, Hodenpyl, Bailey.

Malus (*Pyrus*) *coronaria* Mill. (*Pyrus coronaria* L.) Wild Sweet Crab. Hodenpyl.

Malus (*Pyrus*) *floribunda* Nichols. Japanese Flowering Crab. Bailey and Hicks.

Malus (*Pyrus*) *Halliana* Koehne. (*Pyrus Halliana* Voss) Halls Crab. Bailey, Matheson, Hicks, Havemeyer. Var. *Parkmani* Hort. Matheson, Bailey, DeForest, Hicks.

Malus (*Pyrus*) *ioensis* Bailey. (*Pyrus ioensis* Bailey) Prairie Crab. Bailey, Havemeyer. Var. *plena* Hort., Bailey, Matheson, Hodenpyl, Hicks.

Malus (*Pyrus*) *okaido* Hort. Hodenpyl.

Malus (*Pyrus*) *Kowa Kamii* Hort. Hodenpyl.

Malus (*Pyrus*) *Niedzwetzkyana* Bailey. (*Pyrus Malus*, var. *Niedzwetzkyana*, Aschers & Graehn.) Redvein Crab, Hicks, Havemeyer.

Malus (*Pyrus*) *Prattii* Hort. Hodenpyl.

Malus (*Pyrus*) *prunifolia* Willd. Var. *Rinki* Bailey. Chinese Apple. Bailey.

Malus (*Pyrus*) *robusta* Hort. Cherry Crab. Hodenpyl.

Malus (*Pyrus*) *Sargenti* Rehd. (*Pyrus Sargenti* Bean) Sargent Crab. ailey, Hodenpyl, Havemeyer.

Malus (*Pyrus*) *Scheideckeri* Zabel. (*Pyrus pulcherrima*, var. *scheideckeri* Bailey.) Scheidecker Crab. Bailey, Hicks, Hodenpyl, Havemeyer.

Malus (*Pyrus*) *Sieboldi* Rehd. (*Pyrus Sieboldi* Regel) Toringo Crab. Hodenpyl.

Malus (*Pyrus*) *spectabilis* Borkh. (*Pyrus spectabilis* Ait.)

Chinese Flowering Crab. Bailey, Hodenpyl, Hicks, Havemeyer.

Malrus (*Pyrus*) *sylvestris* Mill. (*Pyrus Malus* L.) Apple, Willys, Tiffany.

Malus (*Pyrus*) *theifera* Bailey. Tea Crab. Bailey, Hodenpyl.

Malus (*Pyrus*) *toringoides* Hughes. (*Pyrus toringoides* Osborn) Cutleaf Crab. Havemeyer.

Malus (*Pyrus*) *Zumi* Rehd. (*Pyrus Zumi* Mats.) Zumi Crab. Bailey, Hicks.

Neillia sinensis Oliv. Tube Neillia. Bailey, Hodenpyl.

Neviusia alabamensis Gray. Snow wreath. Bailey.

Photinia villosa DC. Bailey, Matheson, DeForest, Hodenpyl, Hicks.

Physocarpus capitatus Kuntze. Hodenpyl.

Physocarpus opulifolius Maxim. Common Ninebark. Bailey, Hodenpyl, DeForest.

Potentilla fruticosa L. Shrubby Cinquefoil. Havemeyer, Bailey. Var: *Veitchi* Bean. (Veitch Cinquefoil) Bailey, Hodenpyl, Hicks.

Prinsepia sinensis Olwer. Cherry Prinsepia. Hodenpyl.

Rhodotypos kerrioides Sieb. & Zucc. Jet Bead. DeForest, Hodenpyl, Hicks, Havemeyer.

Prunus Armeniaca L. Apricot, Hodenpyl.

Prunus avium L. Sweet Cherry. Hodenpyl.

Prunus cerasifera Ehrb. Myrobalan Plum. Hodenpyl.

Prunus Cerasus Linn. Sour Cherry. Tiffany, Willys, Hodenpyl.

Prunus glandulosa Thunb. Almond. Double, Pinkflowering variety. Bailey.

Prunus incisa Thunb. var. *serrata* Hort. Bristleleaf Mame Cherry. Hodenpyl.

Prunus japonica Thunb. Dwarf Flowering Cherry. Hicks, Havemeyer.

Prunus Kanzan Hort. Hodenpyl.

Prunus Lannesiana Wils. Hitoye Cherry . Hodenpyl; var. *ariaka* Ariake, Tiffany, Hodenpyl; var. *hatazakuri* Hodenpyl;

var. *ojochin* Hodenpyl, Hort.; var. *Mikuramakaisi* Hodenpyl; var. *sirotae* Hodenpyl; var. *wasinwawa* Hodenpyl.

Prunus maacki Rupr. Amur Cherry. Bailey.

Prunus maritima Wangh. Beach Plum. Hicks, Havemeyer.

Prunus Maximowiczi Rupr. Miyama Cherry. Bailey.

Prunus Mume Sieb. & Zucc. Japanese Apricot. Bailey, Hodenpyl.

Prunus nigra Ait. (*P. Americana* Marsh. var. *nigra* Waugh.) Canada Plum. Havemeyer.

Prunus okuhuyake Hort. Hodenpyl.

Prunus pennsylvanica L. f. Pin Cherry. Bailey.

Prunus pilosiuscula Koehne var. *media* Hort. Hodenpyl.

Prunus Pseudocerasus Lindl. Havemeyer; var. *serrulata* Hort. (?) Oriental Cherry, Hodenpyl, Hicks, Havemeyer; var. *serrulata sachalinensis* Yama Cherry, Hodenpyl, Havemeyer; var. *s. s. fugenzo*, Hodenpyl; var. *Ichiyo*, Hodenpyl; var. *alba-rosa*, Hodenpyl.

Prunus serotina Ehrh. Wild Black Cherry. Bailey, Hicks, Willys.

Prunus shatsuk Hort. Hodenpyl.

Prunus Sieboldi Wittm. Siebold Cherry. Havemeyer.

Prunus spinosa domestica Hort. Hodenpyl.

Prunus subhirtella Miq. Higan Cherry. Bailey, Hodenpyl; var. *pendula*, Hodenpyl.

Prunus tomentosa Thunb. Hicks, Hodenpyl, Bailey.

Prunus triloba Lindl. Flowering Almond. Hodenpyl, Matheson, DeForest, Bailey, Hicks, Havemeyer.

Prunus virginiana L. Choke Cherry. Huntington Road C. S. H.

Prunus yedoensis Mats. Yoshino Cherry. Hodenpyl.

Prunus horticultural varieties:

Ariake (*P. lannesiana ariaka* Hort.), Tiffany, Hodenpyl.

Fugenzo (*P. serrulata sachalinensis fugenzo* Hort.), Hodenpyl.

Hata-zakura (*P. lannesiana hatazakura* Hort.), Hodenpyl.

Ichiyo. Hodenpyl.

Mikurumagaeshi (*P. lannesiana mikurumakaisi* Hort.) Hodenpyl.
Ojochin (*P. lannesiana ojochin* Hort.) Hodenpyl.
Shidare. Higan (*P. subjirtella pendula* Hort.) Hodenpyl.
Shirofugen (*P. serrulata sachalinensis albo-rosa* Hort.) Hodenpyl.
"Shirotae" (*P. lannesiana sirotae* Hort.) Hodenpyl.
"Washinowa" (*P. lannesiana wasinowo* Hort.) Hodenpyl.
"Yoshino Cherry" (*P. yedoensis* Hort.) Hodenpyl.

Pyracantha angustifolia Schneid. Narrowleaf Firethorn. Bailey.

Pyracantha coccinea Roem. Bailey, Hodenpyl. Var: *Lalandi* Dipp. Laland Firethorn. Bailey, Hodenpyl, Matheson, DeForest, Havemeyer.

Pyracantha crenulata Roem. Nepal Firethorn. Bailey.

Pyracantha linifolia Hort. Hodenpyl.

Pyrus communis L. Pear. Hodenpyl.

Pyrus serotina Rehd. Late Pear. Hodenpyl.

Rosa acicularis Lindl. Prickly Rose. Hodenpyl.

Rosa arkansana Porter. Arkansas Rose. Hodenpyl.

Rosa banksiae R. Br. Banksian Rose. Hodenpyl.

Rosa bella Hort. Solitary Rose. Hodenpyl.

Rosa blanda Ait (*R. virginiana Mill.*) Meadow Rose. Hicks. Var. *Willmottiae* Baker, Wilmot Rosa, Hodenpyl.

Rosa baicalensis Hort. Hodenpyl.

Rosa canina L. Dog Rose. C. S. H. vicinity.

Rosa centifolia L. Cabbage Rose. Hodenpyl.

Rosa coriifolia Hort. Leatherleaf Rose. Hodenpyl.

Rosa ecae Hort. Eca Rose. Hodenpyl, Bailey.

Rosa foetida Herrm. Austrian Brier Rose. Hodenpyl, Bailey.

Rosa gayana Hort. Hodenpyl.

Rosa helenae Hort. Helen Rose. Hodenpyl.

Rosa Hugonis Hemsl. Hugo Rose. Havemeyer, Kahn, Bailey, Hicks, Matheson, DeForest, Hodenpyl.

Rosa humilis Marsh (*carolina* L.) Pasture Rosa. Havemeyer.

Rosa Johanensis Hort. Hodenpyl.

Rosa Iheritierana Hort. Boursault Rose. Hodenpyl.
Rosa lucida Ehrh. Virginia Rose. Hodenpyl, Hicks.
Rosa Macouni Hort. Macoun Rosa. Hodenpyl.
Rosa maximowicziana var. *jacki* Hort. Hodenpyl.
Rosa mirifico Hort. Hodenpyl.
Rosa moyesi Hort. DeForest.
Rosa multibracteata Hort. Hodenpyl.
Rosa multiflora Thunb. Japanese Rose. Tiffany, Hodenpyl, Kahn; var. *cathayensis* Bailey. (Cathay Rose), Hodenpyl.
Rosa nitida Willd. Bristly Rose. Hodenpyl, Hicks.
Rosa omeiensis Rolfe. Mount Omei Rose. Hodenpyl; var. *pteracantha*, Country Life Press.
Rosa palustris Marsh (?) Swamp Rose. Hodenpyl.
Rosa Persica Michx. Persian Rose. DeForest.
Rosa pisocarpa Gray (?). Hodenpyl.
Rosa rudinuscula Hort. Hodenpyl.
Rosa pyrifera Hort. Hodenpyl.
Rosa roxburghi normalis Hort. Single Roxburgh Rose (*R. microphylla* Roxb.) Hodenpyl.
Rosa rubens Hort. Hodenpyl.
Rosa rubiginosa L. Sweet Brier. Matheson, Hodenpyl.
Rosa rugosa Thunb. Rugosa Rose. Tiffany, Willys, Huntington, Matheson, DeForest, Hodenpyl, Havemeyer; var. *repens* Hort.; *alba* Hort. Hodenpyl.
Rosa salictorum Hort. Hodenpyl.
Rosa sertata Hort. Garland Rose. Hodenpyl.
Rosa setigera Michx. Prairie Rose. Tiffany, Matheson, DeForest, Hodenpyl, Hicks, Dana Island.
Rosa spinosissima L. Scotch Rose. DeForest, Hodenpyl, Havemeyer, Country Life Press; var. *altaica* Hort. DeForest, Hodenpyl; var. *myriacantha* W. D. Koch. Hodenpyl.
Rosa stellata Wooton. New Mexican Rose. Hodenpyl.
Rosa Watsoniana Crep. Watson Rose. Hodenpyl.
Rosa wichuraiana Crep. Wichurian Rose. Matheson, Hodenpyl, Hicks, DeForest.

Rosa xanthina Lindl. Korean Rose. DeForest, Hodenpyl, Havemeyer.

Rosa horticultural varieties:

Aglaia Mult. (P. Lamb. 1896) Yellow Rambler. Hodenpyl.
Alfred Colomb H. P. (Lach. 1865) DeForest, Hodenpyl.
American Beauty Cl. DeForest, Matheson.
American Pillar H. W. (Van F. 1902) Matheson.
Arnold H. Rug. (Dawson 1893) Hodenpyl.
Avoca HT (A. Dicks, 1907), Matheson.
Baby Rambler, Red., DeForest.
Baby Tausendschon Tiffany, Matheson, DeForest.
Baltimore Belle. Set. (Feast 1843), Hodenpyl.
Baroness Rothschild, H.P. (Pernet 1867), Matheson, DeForest, Hodenpyl.
Bennet's seedling. Matheson.
Betty, H. T. (A. Dicks 1905) Matheson, DeForest.
Blue Rambler. Hodenpyl.
Captain Christy HT. (Lach. 1873) DeForest, Hodenpyl.
Captain Hayward HT. (Ben. 1893) Tiffany, DeForest.
Carolina Testout. DeForest, Hodenpyl.
Catherine Zeimer, DeForest.
Chatenay. DeForest.
Chateau de Clos Vougeot. HT. (Per D. 1908) DeForest.
Christine Wright HW. (Hoopes 1909) DeForest.
Clio HR. (W. Paul 1894) Matheson.
Columbia HT. (E. G. Hill 1917) Willys, Kahn.
Countess of Darby HT. (A. Dicks 1905) Hodenpyl.
Crimson Rambler. Mult. (Turn 1893) Matheson, DeForest, Hodenpyl, Tiffany.
Daily Mail. DeForest.
Dawson Mult (Dawson 1889) Hodenpyl.
Dean Hole HT (A. Dicks, 1907) Hodenpyl.
Dacota (Padres.) Matheson.
Dorothy Page-Roberts HT (A. Dicks, 1907) Matheson, Hodenpyl.
Dorothy Perkins, H. W. (J. & P. 1902) Willys, Matheson, Kahn, DeForest, Hodenpyl, Tiffany.
Dorothy Perkins, Baby, Matheson.
Dorothy Perkins, White, Matheson.
Double White Killarny HT (Bud. 1913, Tot. 1914) Matheson.
Dr. W. Van Fleet, H. W. (Van F. 1910) Tiffany, Matheson, DeForest, Hodenpyl.
Duchess of Wellington, HT (A. Dicks, 1909) Matheson, Willys.
Earl of Dufferin HP (A. Dicks 1887) Hodenpyl.

Earl of Warwick HT (W. Paul 1904) DeForest.
Echo P. Pol. (P. Lamb 1914) Kahn.
Eclair HP (Lach 1883) DeForest.
Eglantine. Matheson.
Elli Hartmann, HT (Welt 1913) DeForest.
Emily Gray, HW (Williams 1918) DeForest.
Etoile de France HT (Per D. 1904) Hodenpyl.
Euphrosyne. Mult. (P. Lamb. 1896) Matheson.
Evangeline H. W. (Wallsh 1906) DeForest.
Evergreen Gem. HW (Manda 1889) Hodenpyl.
Farquhar, HW. (Dawson 1903) Hodenpyl.
Fisher Holmes HP (E. Verd. 1865). Hodenpyl.
Florence Pemberton HT (A. Dicks 1903) Matheson.
Francois Juranville HW (Bar 1906) DeForest.
Frau Karl Druschki, HP (P. Lamb. 1900) Tiffany, Matheson, DeForest, Hodenpyl.
F. W. Flight. Matheson.
Gardenia HW (Manda 1899) Matheson, Hodenpyl.
General Jacqueminot HP (Roussel 1852) Matheson, Hodenpyl.
General MacArthur (E. G. Hill 1904) Matheson, DeFoerst.
George Dickson HP (A. Dicks 1913) Matheson.
Golden Ophelia HT (B. R. Cant 1919) DeForest.
Greville, Mult, Hodenpyl.
Harrison's Yellow AB (Harrison 1830) Hodenpyl.
Harry Kirk T. (A. Dicks 1907) DeForest, Hodenpyl.
Hiawatha, H. W. (Walsh 1904) Willys, Matheson, DeForest, Hodenpyl.
Hon. Edith Gifford T. (Gio.; Fils. 1882) Hodenpyl.
Irish Afterglow HT (A. Dicks 1918) DeForest.
Irish Elegance, HT (A. Dicks, 1905) DeForest.
Irish Engineer, HT (A. Dicks, 1904) DeForest.
Irish Fireflame HT (A. Dicks 1913) DeForest.
Jonkheer J. L. Mock, H. T. (Leend, 1909) DeForest.
Kaiserin Auguste Viktoria HT (Lambert & Reiter 1891) Matheson, DeForest, Hodenpyl.
Katherine Zeimet, D. Pol (P. Lamb. 1901) DeForest.
Killarney H. T. (A. Dicks 1898) DeForest, Diffany, Willys, Hodenpyl.
Killarney Brillant. H. T. (A. Dicks, 1914) DeForest.
LaFrance HT (Guil. Fils. 1867) Matheson, Hodenpyl.
Killarney Queen HT (Bud. 1912) DeForest.
Killarney White. DeForest.
La Tosa HT (Mme Schw. 1900) Matheson, DeForest.
Lady Alice Stanley HT (Meg. 1909) Hodenpyl.

Lady Ashtown, HT (A. Dicks, 1905) Matheson, DeForest, Hodenpyl.
Lady Duncan HW (Dawson 1900) Hodenpyl.
Lady Hillingdon, T. (L. & S. 1910) Matheson, DeForest.
Lady Penzance H. & S.B. (Penz. 1894) Kahn.
Lady Ursula HT (Per D. 1907) Matheson, DeForest, Hodenpyl.
Laurent Carle HT (Per. D. 1907) DeForest, Hodenpyl, Matheson.
Lyon, R. Per (Per. D. 1907) DeForest, Hodenpyl.
Marechal Niel Nois. (Pradel 1864) Matheson.
Marie Paric T. Pol. (Alegatiere 1888) Hodenply.
Marquise de Sinety, HT (Ter. D. 1906) DeForest.
Mary, Countess of Ilchester, HT (A. Dicks 1909) Matheson, Hodenpyl.
Mary Wallace H. W. (Van F. 1921) DeForest.
Max Graf. H. Rug. (Bowditch 1919) Hodenpyl.
Miss Cynthea Fords HT (H. Dicks 1909) Matheson, DeForest.
Austrian Copper A. B. (Ger. 1596) Hodenpyl.
Areateur Bleriot H. W. (Fauq. 1910) Matheson, DeForest.
Miss Lolita Armour. Per (H. & S. 1919) DeForest.
Mme. Abel Chatenay, HT (Per. D. 1894) DeForest.
Mme. Butterfly, HT (E. G. Hill 1918) DeForest.
Mme. Caroline Testout HT (Per. D. 1890) Hodenpyl.
Mme. Edouard Herriot. Per. (Per. D. 1913) DeForest.
Mme. Joseph Combet. HT (Bonnaire 1894) Hodenpyl.
Mme. Jules Grolez. HT (P. Guil. 1897) DeForest.
Mme. Leon Pain. HT (P. Guil, 1904) Mathesan, DeForest.
Mme. Melanie Soupert, HT (Per. D. 1905) DeForest, Hodenpyl.
Mme. Ravary HT (Per. D. 1899) DeForest.
Mme. Segond Weber HT (S. & N. 1908) DeForest.
Mollly Sharman-Crawford, T. (A. Dicks, 1908) DeForest.
Mrs. Aaron Ward, H. T. (Per D. 1907) Matheson, DeForest.
Mrs. John Laing HP (Ben. 1887) Matheson, DeForest, Tiffany.
Mrs. R. G. Sharman, Crawford, HP (A. Dicks 1894) Tiffany, Matheson, Kahn, Hodenpyl.
Mrs. Wakefield Christie-Miller HT (M. & G. 1909) Matheson DeForest.
My Maryland HT (J. Cook 1908) DeForest .
Ophelia, HT (W. Paul 1912) Tiffany, Willys, Matheson, DeForest.
Paul Newron HP (Levet 1869) Matheson, DeForest.
Paul's Scarlet Climber, H. W. (W. Paul 1916) Matheson.
Persian Yellow AB (Willock 1837) Kahn, Hodenpyl.
Pilgrim, H. T. (Mont. 1920) Kahn.
Prince Camille de Rohan HP (E. Verd. 1861) Hodenpyl.
Prince de Bulgarie HT (Per. D. 1902 DeForest, Hodenpyl.
Provence Rose. Hodenpyl.

Queen of Fragrance, HT (W. Paul 1915) DeForest.
Queen of the Prairies Set. (Feast 1843) Hodenpyl.
Radiance HT (J. Cook 1908) Matheson, DeForest.
Red Chatenay, HT. DeForest.
Red Radiance HT (A. N. Pier, 1916) Matheson.
Red Rugosa. Matheson.
Rev. F. Page-Roberts HT (B. R. Cant 1921) DeForest.
Rubin, Mult. (Schmidt 1899) Hodenpyl.
Rugosa alba. Matheson.
Seven Sisters. Greville, Hodenpyl.
Silver Moon, H. W. (Van F. 1910) Hodenpyl, Matheson, DeForest.
South Orange Perfection, HW (Manda 1899) Hodenpyl.
Souv. de Claudius Pernet. Par (Per. D. 1920) Kahn, Matheson, DeForest.
Souv. de Georges Parnet. Per (Per. D. 1921) Matheson.
Sunburst HT (Per. D. 1912) Kahn, DeForest.
Tausendschon. Mult. (Schmidt 1906) Matheson, DeForest, Hodenpyl.
Ulrich Brunner HP (Levet 1881) Tiffany, Matheson, Hodenpyl.
Universal Favorite HW. (Manda 1899) Hodenpyl.
Veilchen blau. Mult. (Schmidt 1908) Hodenpyl.
Viscountess Folkestone HT. (Ben. 1886) Matheson, DeForest.
White Killarney HT. (Wahan Rose Conservatories 1909) Matheson, DeForest.
William C. Egan. HW (Dawson 1900) Hodenpyl.
Willowmere. Per. (Per. D. 1913) DeForest.
Yvone Rabier. D. Pol. (Tur. 1910) Matheson, DeForest.

Rubus flagellaris Willd. Dewberry C. S. H., Sandpit Road.
Rubus laciniatus Willd. Cutleaf Blackberry. Hodenpyl, Bailey.
Var. *leucodermis* Card. Whitebark Raspberry. Bailey.
Rubus occidentalis L. Black Raspberry. C. S. H. vicinity.
Rubus odoratus L. Flowering Raspberry. Hodenpyl, Matheson. Laboratory grounds, C. S. H.
Rubus phoenicolasius Maxim. Wineberry. Laboratory grounds, C. S. H.
Rubus spectabilis Pursh. Salmonberry. Havemeyer.
Rubus thyrsanthus Focke. Himalaya Berry. Bailey.
Rubus thyrsoideus Hodenpyl.
Rubus ulmifolius Schott. Elmleaf Blackberry. Hodenpyl.
Rubus xanthocarpus Bur. & Franch. Havemeyer.
Sorbaria Aitchisoni Hemsl. Kashmir False Spirea. Bailey, Hodenpyl, Hicks, Country Life Press.

Sorbaria arborea Schneid. Tree Spirea. Hodenpyl.

Sorbaria Lindleyana Maxim. Lindley False Spirea. Bailey.

Sorbaria sorbifolia A. Br. Ural False Spirea. Bailey, Sandspit Road, C. S. H. Matheson, DeForest, Hodenpyl, Havemeyer.

Sorbus americana Marsh. Mountain Ash. Hicks, Hodenpyl, Matheson, Tiffany, DeForest, Havemeyer.

Sorbus Aucuparia L. Service Tree. European Mountain Ash. Matheson, Hodenpyl, Bailey.

Sorbus domestica L. Service Tree. Hodenpyl.

Stephanandra flexuosa Sieb. & Zucc. (*Incisa*, Zabal) Cutleaf Stephanandra. Bailey, Matheson, Hodenpyl, Hicks, Davenport garden, C. S. H., Havemeyer.

Stephanandra Tanakae Franch & Sav. Yeddo Stephanandra. Bailey.

Spiraea alba Dur. Meadow Spirea. Matheson, Bailey.

Spiraea albiflora Miq. Matheson, Hodenpyl, Havemeyer.

Spiraea arguta Zabel. Garland Spirea. Hodenpyl, Hicks.

Spiraea Billiardii Hort. Hicks, Bailey, Havemeyer.

Spiraea Bumalda Bur. Matheson, Hicks, Bailey.

Spiraea cantoniensis Louv. var. *lanceata* Hort. Matheson.

Spiraea chamaedryfolia L. var. *ulmifolia* Max. Elmleaf Spirea. Hodenpyl.

Spiraea Chinensis Max. Chinese spirea. Hodenpyl.

Spiraea crenata L. Snow Spirea. Hodenpyl.

Spiraea gloria Hort. Hodenpyl.

Spiraea henryi Hemsl. Henry Spirea. Bailey, Hodenpyl.

Spiraea inflexa C. Koch. Hodenpyl.

Spiraea japonica L. Japanese Spirea. Hicks, Hodenpyl, Pratt.

Spiraea latifolia Borkh. Pink Meadow Spirea. Bailey, Tiffany, Hodenpyl, Hicks.

Spiraea lucida Dougl. Hodenpyl. Var. *plena* Hort. Matheson.

Spiraea prunifolia Sieb. & Zucc. Bridal Wreath. Bailey, Matheson, Havemeyer.

Spiraea Reevesiana Lindl. (*S. Cantoniensis* Lour.) Reeves Spirea. DeForest, Hodenpyl.

Spiraea Rosthorni Pritz. Rosthorn Spirea. Hodenpyl.

Spiraea salicifolia L. Willowleaf Spirea. Hodenpyl.
Spiraea Sargentiana Hort. Hodenpyl.
Spiraea sylvestris Hort. Hodenpyl.
Spiraea Thunbergii Sieb. Thunberg Spirea. Tiffany, Matheson, DeForest, Hodenpyl, Bailey, Hicks, Havemeyer, Pratt.
Spiraea trichocarpa Hort. Hodenpyl.
Spiraea tomentosa L. Hardhack. Hodenpyl.
Spiraea Vanhouttei Zabel. Van Houtti Spirea. Matheson, Hicks, Tiffany, DeForest, Hodenpyl, Havemeyer.
Spiraea Veitchi Hemsl. Veitch Spirea. Hodenpyl, Bailey.
Spiraea—Horticultural varieties:

Anthony Waterer Spirea (*Spiraea Bumalda* Burr.) Tiffany, Matheson, Hodenpyl, Hicks, Bailey, Willys.
Billiard Spiraea (*S. Billiardi Herincq.*) Hicks, Bailey, Havemeyer.
Double Bridal Wreath (*Spiraea prunifolia* var. *plena* Hort.) Matheson.
Double Reeves Spirea (S. Cantoniensis var. lanceata) Hort. Matheson.
Garland Spirea (*S. arguta* Hort.) Hodenpyl, Hicks.

LEGUMINOSAE.

Albizzia Lebbek Benth. Lebbek Tree. Havemeyer.
Amorpha canescens Nutt. Lead Plant. Hodenpyl, Bailey, Hicks.
Amorpha fruticosa L. Bastard Indigo. Matheson. Laboratory grounds, C. S. H., Bailey, Hicks; var. *glabra* Desf. Mountain Indigo. Bailey.
Amorpha microphylla Pursh. Dwarf Indigo. Hodenpyl.
Apios tuberosa Moench. Potato Bean. Hodenpyl, Matheson.
Baptisia australis R. Br. Blue Wild Indigo. Matheson, DeForest, Hicks.
Baptisia tinctoria R. Br. False Indigo. Hodenpyl, Hempstead Plain, Matheson.
Calliandra Tweedii Benth. Havemeyer.
Caragana arborescens Lam. Siberian Pea-Shrub. Matheson, DeForest, Bailey, Hicks, Havemeyer.
Cassia marilandica L. Wild Senna. Matheson.

Cercis canadensis L. American Red bud. Tiffany, Matheson, DeForest, Hodenpyl, Bailey, Hicks, Havemeyer.

Cercis chinensis Bunga. Chinese Red bud. Hodenpyl, Hicks.

Cercis Siliquastrum L. Judas Tree. Willys.

Chorizema ilicifolium Labill. Bailey.

Cladastris amurensis Koch. Amur Maackia. Hicks, Bailey.

Colutea arborescens L. Common Bladder Senna. Bailey, Matheson, Hodenpyl, Hicks, Havemeyer.

Colutea orientalis Mill. Oriental Bladder Senna. Bailey, Hodenpyl.

Coronilla glauca L. Honey Coronilla. Havemeyer.

Cladrastis lutea Koch. Yellow Wood. Bailey, Matheson, Hicks, Dana Island.

Cytisus canariensis Kuntze. Canary Bridal Veil. Bailey, Willys.

Cytisus leucanthus Waldst. & Kit. Pale Broom. Hodenpyl. Var. *schipkaensis* Dipp. Bulgarian Bridal Veil. Bailey.

Cytisus nigricans L. Spike Broom. Hodenpyl.

Cytisus racemosus Nichols. Easter Broom. Havemeyer.

Cytisus scoparius Link. Scotch Bridal Veil. Bailey, Hodenpyl, Hicks, Havemeyer. Var. *andreanus* Dipp. (Paradise Broom), Matheson.

Desmodium canescens (L) DC. Hoary Tick Clover. Matheson.

Dolichos lablab L. var. *giganteus* Hort. Giant Hyacinth Bean. Tiffany.

Galega officinalis L. Goat's Rue. Havemeyer, Matheson.

Genista Aetnensis DC. Aetna Broom. Tiffany.

Genista pilosa L. Silkyleaf Broom. Hodenpyl.

Genista tinctoria L. Dyers Greenweed. Havemeyer; var. *virgata* Hort. Tall Woadwaxen, Hodenpyl.

Gleditsia triacanthos L. Honey Locust. Bailey, Tiffany, Matheson, DeForest, Hodenpyl, Hicks; var. *inermis* DC. (Thornless Honey Locust), Hicks.

Gymnocladus dioica (L.) Koch. Kentucky Coffee Tree. DeForest, Hodenpyl, Hicks.

Halimodendron argenteum Fisch. Salt Tree. Hodenpyl.

Indigofera amblyantha Craib. Pink Indigo. Hodenpyl, Hicks, Havemeyer.

Indigofera decora Lindl. Chinese Indigo. Hodenpyl. Var: *alba* Hort., *purpurea* Hort., Havemeyer.
Indigofera Gerardiana Grah. Himalayan Indigo. Bailey.
Indigofera Kirilowi Max. Kirilow Indigo. Bailey, Hodenpyl.
Indigofera potanini Hort. Potanin Indigo. Bailey, Hodenpyl, Havemeyer.
Indigofera purpurea Hort. Hodenpyl.
Indigofera tinctoria L. Indigo. Bailey.
Laburnum Adami Kirchn. Adam Laburnum. Bailey.
Laburnum alpinum Griseb. Scotch Laburnum. Bailey, Tiffany, DeForest, Hodenpyl.
Laburnum vulgare Griseb. (*L. anagyroides* Medic.) Goldenchain. Bailey, Matheson, Hicks, Havemeyer.
Laburnum Watereri Dipp. Waterer Laburnum. Bailey.
Lathyrus latifolius L. Perennial Pea. Havemeyer, Bailey, Tiffany, Matheson, Hodenpyl; var. *splendens* Hort. (Royal Perennial Pea), Hodenpyl; var. *albus* Hort. (White Perennial Pea), Hodenpyl.
Lathyrus odoratus L. Sweet Pea. Matheson.
Lespedeza bicolor Turcz. Shrub Bushclover. Bailey, Hicks.
Lespedeza formosa Koehne. Purple Bushclover. Bailey, Hodenpyl, Havemeyer; var. *albiflora* Hort. (*Lespedeza japonica* Bailey?), Dana Island.
Lespedeza praecox Hort. Hodenpyl.
Lespedeza striata Hook & Arn. Japan Clover. Havemeyer.
Lupinus albus L. White Lupine. Havemeyer.
Lupinus arboreus Sims. Tree Lupine. Bailey, DeForest.
Lupinus perennis L. Sun-Dial Lupine. Hodenpyl, Hicks.
Lupinus polyphyllus Lindl. Washington Lupine. Tiffany, Matheson, Kahn, DeForest, Hicks.
Maackia Faurei Hort. Hodenpyl.
Medicago sativa L. Alfalfa. C. S. H.
Melilotus indica All. Laboratory grounds, C. S. H.
Mimosa pudica L. Sensitive Plant. Havemeyer.
Robinia hispida L. Rose Acacia. Havemeyer, Pratt.
Robinia Pseudoacacia L. Yellow Locust. Tiffany, Willys, Bailey, Matheson, DeForest, Hodenpyl, Pratt.

Sophora japonica L. Chinese Pagoda tree. Matheson, DeForest, Hodenpyl, Hicks, Havemeyer, Pratt.

Sophora viciifolia Hance. Vetchleaf Sophora. Hodenpyl.

Swainsonia galegifolia R. Br. Goats Rue, Senna Pea. Havemeyer.

Thermopsis Caroliniana M. A. Curtis. Carolina Thermopsis. Bailey, Kahn, DeForest.

Thermopsis fabacea DC. Bean Thermopsis. Hodenpyl.

Thermopsis rhombifolia Richards. Hodenpyl.

Trifolium hybridum L. Alsike Clover. Laboratory grounds, C. S. H.

Trifolium pratense L. Red Clover. Laboratory grounds, C. S. H.

Vicia Cracca L. Laboratory grounds, C. S. H.

Wisteria frutescens Poir. American Wisteria. Hodenpyl, Hicks. Var. *"magnifica"* Herincq, Hicks.

Wisteria multijuga Van Houtte (*W. floribunda* DC.) Long-cluster Wisteria. Tiffany, Matheson, Kahn, DeForest, Hicks.

Wisteria sinensis Sweet. Chinese Wisteria. DeForest, Hicks, Davenport, Bailey, Matheson, Havemeyer. Var. *albiflora* Le Maire. White Chinese Wisteria, DeForest.

Wisteria speciosa Nutt. Var. *magnifica* Hort. Yellow Eye Wisteria. Hodenpyl.

Wisteria venusta Rehd. & Wils. Silky Wisteria. Tiffany, DeForest, Hicks, Bailey.

ORDER XXIII. GERANIALES.

GERANIACEAE.

Geranium maculatum L. Wild Geranium. Matheson.

Geranium sanguineum L. Bloodred Cranesbill. DeForest, Hodenpyl.

Pelargonium domesticum. Bailey. Lady Washington Geranium. Kahn.

Pelargonium graveolens L'Her. Rose Geranium. Matheson, Country Life Press.

Pelargonium peltatum Ait. Ivy Geranium. Fish Hatchery, C. S. H.

OXALIDACEAE.

Oxalis corniculata L. Wood-Sorrel. Matheson.

Oxalis violacea. Violet Woodsorrel. Tiffany, Hodenpyl.

TROPAEOLACEAE.

Tropaeolum majus L. var. *nanum* Hort. Tom Thumb Nasturtium. Tiffany.

LINACEAE.

Linum flavum L. Golden Flax. Matheson, DeForest.

Linum grandiflorum Desf. Flowering Flax. Havemeyer.

Linum perenne L. Perennial Flax. Bailey, Tiffany, Matheson, Kahn, DeForest, Hodenpyl, Hicks, Havemeyer, Country Life Press.

RUTACEAE.

Dictamnus albus L. Gas Plant. Bailey, Tiffany, Matheson, DeForest, Hicks, Country Life Press; var. *rubra* Hort. (Purple Gas Plant), Bailey, Matheson, DeForest.

Phellodendron chinense Schneid. Chinese Corktree. Matheson, Hodenpyl.

Phellodendron japonicum Maxim. Havemeyer.

Poncirus trifoliata Raf. Trifoliate Orange. Davenport.

Ptelea trifoliata L. Common Hoptree. Hicks, C. S. H. Village.

Ruta Graveolens L. Common Rue. Hicks.

Skimmia japonica Thunb. Japanese Skimmia. DeForest, Havemeyer.

Xanthoxylum americanum Mill. Common Prickly Ash. Hodenpyl, Bailey.

Xanthoxylum piperitum DC. Japanese Prickly Ash. Hodenpyl.

SIMARUBACEAE.

Ailanthus altissima Swingle. Tree-of-Heaven. Pratt.

Ailanthus Glandulosa Desf. Chinese Tree of Heaven. Matheson, Willys, Bailey, Hicks.

MELIACEAE.

Cedrela sinensis Juss. Chinese Cedrela. Bailey.

POLYGALACEAE.

Polygala paucifolia Willd. Fringed Polygala. Hodenpyl.

EUPHORBIACEAE.

Daphniphyllum humile Hort. Hodenpyl.

Daphniphyllum macropodum Miq. Bailey.

Euphorbia corollata L. Flowering Spruge. Bailey, Tiffany, Matheson.

Euphorbia fulgens Karw. Scarlet plume. Kahn.

Euphorbia marginata Pursh. Snow-on-the-Mountain. Tiffany.

Poinsettia pulcherrima Klotzsch & Garcke. Poinsettia. (*Euphorbia pulcherrima* Willd.), Tiffany, Matheson.

(To be continued.)

NOTE

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